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THE

YEAR-BOOK OF FACTS

IN

Science and Art:

EXHIBITING

THE MOST IMPORTANT DISCOVERIES AND IMPROVEMENTS
OF THE PAST YEAR,

IN MECHANICS AND THE USEFUL ARTS; NATURAL PHILOSOPHY;
ELECTRICITY; CHEMISTRY; ZOOLOGY AND BOTANY; GEOLOGY
AND MINERALOGY; METEOROLOGY AND ASTRONOMY.

Illustrated with Engravings.

BY THE EDITOR OF "THE ARCANA OF SCIENCE."

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>
> PRESIDENT'S Address to the BRITISH ASSOCIATION, 1842.

"The MISSOURI LEVIATHAN," see page 271.

LONDON
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1843

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OF
HYDRAULIC & OTHER MACHINES
FOR RAISING WATER,
ANCIENT AND MODERN

INCLUDING THE PROGRESSIVE DEVELOPMENT OF THE
Steam Engine, &c.

BY THOMAS EWBANK

THE art of raising water has ever been closely connected with the progress of man in civilization, so much so, indeed, that the state of this art among a people may be taken as an index of their position on the scale of refinement It is also an art, which, from its importance, called forth the ingenuity of man in the infancy of society, nor is it improbable that it originated some of the simple machines of mechanic powers themselves

It was a favourite subject of research with eminent mathematicians and engineers of old, and the labour of their successors in modern days have been rewarded with the most valuable machine which the arts ever presented to man, the STEAM ENGINE, for it was "raising of water" that exercised the ingenuity of Decatus and Worcester, Morland and Papin, Savary and Newcomen, and those illustrious men whose successive labours developed and matured that "semi-omnipotent engine," which "draweth up water by fire,"—a machine that has already changed and immeasurably improved the state of civil society, and one which, in conjunction with the printing-press, is destined to renovate both the political

and the moral world The subject is, therefore, intimately connected with the present advanced state of the arts, and the amazing progress made in them during the last two centuries may be attributed in some degree to its cultivation —Preface.

From the "Athenæum"

The work before us has characteristics which distinguish it both from modern and ancient works on the same subject, and at the same time class it with either Taking up this single volume, the reader perceives the binding and aspect of a modern book elegantly bound in cloth on opening it however he sees closely set type, the economical margin, the dense reading of an ancient folio Imagine one of the tomes of Grævius inserted in a Bramah's press, and compressed in all its dimensions until margins, type, and matter, are all reduced to the bulk of an imperial octavo, and you have a tolerable idea of the appearance of this book It is, indeed, a compressed library On the subjects here treated tomes have been multiplied to an amazing extent Their essence is given in this volume In short, it is such a work of labour and original research as we rarely see It is an acceptable contribution to the literature of mechanical science and practical engineering a valuable work of reference to those who have not access to the original sources, and a useful epitome to those who have

We regret we cannot tell our readers more about the author than the book enables us to glean We remember to have met with the name in the discharge of some useful practical or scientific function somewhere before but where or how we are unable to recollect But we do not with the less confidence and satisfaction thank the author for his kindly meant, well executed, and very useful book

Of himself the author tells us thus much —That circumstances led him in early life to take an interest in practical hydraulics (perhaps he is an engineer) that he became anxious to obtain an account of all the contrivances employed by different people to raise water, whether for domestic, agricultural mining, manufacturing, or other purposes and that his disappointment was great on finding no book containing all the information he sought This, he says was thirty or forty years ago, (of course he is from fifty to seventy years old) The want he felt he endeavoured to supply During these thirty or forty years he has read and collected a great deal from various and voluminous sources Doubtless he has found in his much reading much rubbish he has been heaping up knowledge for thirty years, and after much threshing winnowing and sifting has separated the precious grains of wheat from much chaff, and presents the reader with the pabulum of the heterogeneous mass as nutritious food for the rising generation of mechanics and engineers

In a short introductory paragraph the author modestly states what he has attempted, and still more modestly his views and ambitions of authorship It is merely justice to a laborious, conscientious, intelligent, and well read author to say, that he has amply and ably fulfilled the excellent intentions with which he has undertaken the work and that he disarms criticism equally by the outstanding merit of the work, as by his own retiring modesty

There is some necessity to caution those of our readers who are mechanics from expecting it to be exclusively what they may wish to find it, and at least an equal necessity for preventing misconception in those who *are not* accomplished mechanics, lest they should anticipate a greater degree of repulsive technicality than exists The book is by no means a repository of practical mechanics for the mere workman He must not look here for the plans, details, and specifications which may enable him to execute hydraulic machinery, or estimate the cost of works or the effect of engines. As little should the amateur of mechanics be repelled from the book, by fearing that a professed treatise on hydraulics, of about 600 closely printed large octavo pages, is much too formidable for any but a professed engineer. The title may much mislead both of these opposite readers. The book comprehends only the *literature* of hydraulics, not its technology. It might have been entitled "Curiosities of Hydrology," or "Anecdotes of Water Works," with perfect propriety. *It is full of the gossip of the art*: it is just such a book as any amateur of mechanics would allow to lie open upon his table, for the purpose of passing the little fragments of his time in occupation of a light and useful description. To have such a book always open for those little *fragments of time*, which form so large an aggregate by the end of life is, we may be permitted to add, a salutary expedient for those who consider life too short for all we should learn and do. At the same time we should do injustice to the solid merits of the book, did we not add, that as it contains general descriptions and illustrative woodcuts of every class of machine which has (so far as we know) ever been used since wells were wanted, or waters required to be raised or obtained in other ways or at other places than just where and when the rains of heaven left them, it is the kind of work which every mechanic or inventor ought often to consult.

The book abounds with the gossip of engineering and the romance of hydraulics. Its indefatigable author seems to have hunted in all sorts of odd corners for interesting materials. The following account of the "Syracusan" would be taken by a modern reader to be a description of the "Great Western," or "Great Britain," or some other leviathan of the deep in the present century. It is, however, the work of Archimedes, the famous geometer and natural philosopher, and dates before the commencement of the Christian era. She presents refinements in luxury, which open up a field of further improvement to our modern ship builders; and we recommend the following paragraph to the notice of the Lords of the Admiralty and the Surveyor of the Navy as a tolerable specification for the building and fitting of Her Majesty's steam yacht which they are about to construct.—*See* pp. 146-147.

From the "SURVEYOR, ENGINEER, AND ARCHITECT."

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From the "INTELLIGENCER."

This is a highly valuable production, replete with novelty and interest, adapted to gratify equally the historian, the philosopher, and the mechanician, being the result of a protracted and extensive research among the arcana of historical and scientific literature.

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☞ The work is published annually, in *January*.

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THE FRONTISPIECE:

GEOLOGICAL SECTION OF THE ARTESIAN WELL OF GRENELLE, AT PARIS.

The prefixed engraving has been reduced from a print, (size 29 inches by 20 inches,) recently published in Paris, and illustrating, at one view, both scientifically and popularly, (if not pictorially,) the Artesian Well bored for the supply of the Abattoir of Grenelle, with the Strata of various kinds through which it passes. The original plate is dedicated to the Count de Rambuteau, Peer of France, and Prefect of the Department of the Seine, and to the Municipal Council of the City of Paris: it likewise bears the *fac-simile* signatures of MM. Mulot, "père et fils," the engineers of this surprising work, of which the following *résumé* is appended:—

"The geological structure of the soil of Paris, beneath the Abattoir of Grenelle, is here exactly represented, from the Artesian Spring to the surface, in the vertical column figured in the plate. The extent of each bed and its colour have been furnished by M. Mulot, and faithfully copied, in the proportion of a thousandth (or of a millimetre for each metre) from the relief plan in the cabinet of M. L. C. Biret, keeper of Abattoirs, reduced precisely to one thousandth, constructed with the materials taken from the Well itself, and arranged by M. Mulot, in the succession wherein they were obtained.

In order to appreciate at one glance the grandeur of M. Mulot's labour, are placed at the base of the column, and on a level with the Artesian spring, the loftiest buildings of Europe and Paris: St. Peter's, at Rome, The Cathedral of Strasburg, Nôtre Dame*, and Les Invalides. Upon the level of the soil, in its natural place, is the Abattoir of Grenelle, and the external tube of the Well, 28 metres in height. The edifices, the abattoir, and their accessories, are precisely reduced to one thousandth, but to reduce the diameter of the tube to this scale was impracticable.

"The boring of the Well of Grenelle was commenced on the 24th of December, 1833, and the water spouted up on the 26th of February, 1841, at a quarter past 2, p. m. Thus the work occupied seven years, one month, twenty-six days. The depth of the Well is 547 metres (1684 ancient feet).† The quantity of wholesome water thrown up in twenty-four hours, is more than 3,400,000 litres, or about four litres‡ to each inhabitant of Paris. The temperature of the water is 27·6 Centig.§ By chemical analysis the water appears to be purer than that of the Seine."

The progress of the boring has been recorded in the predecessors of the present volume. Thus, in the *Year Book of Facts*, 1839, p. 224, it is stated that in January of that year, the bore had reached 1100 feet, and M. Elie de Beaumont foretold that water would not be found till 1600 feet depth, or 194½ feet short of the depth at which it was actually obtained.

---

* It has been found expedient to omit Nôtre-Dame, in reducing the plate.
† 1794½ English feet.
‡ Somewhat less than a gallon.
§ 81°·7 Fahrenheit.

In the *Year-Book*, 1840, the sound or borer was stated to weigh 20,000 lbs., to be treble the height of that of the dome of the Hospital of Invalids, and to require two machines of immense power to put it in motion. In July, 1839, the depth bored was 1584 feet.

In the *Year-Book*, 1841, are recorded some interesting facts respecting the increase of temperature with depth.

In the *Year-Book*, 1842, is engraved a section of the Well, with explanatory notes by Sir John Robison. And at page 273 of the present volume, are the details of the operation of tubing, &c.

The accidents which occurred during the undertaking, as the breaking of the boring instruments, &c. have added materially to the delay and expense. The most serious accident was in May, 1837, when at a depth of 1246 ft. 8 in., the chisel with which the ground was perforated, and a length of 262 feet of rods fell to the bottom; but, although these weighed 5 tons, M. Mulot tapped a screw on the head of the rods, and thus connecting another length to them, after fifteen months' labour, drew up the chisel in August, 1838. On April 8, 1840, in boring the rock chalk, the chisel, having been raised with great force, sunk at one stroke 85 ft. 3 in. into the chalk.

Throughout their labours, the engineers were supported by the opinions of MM. Elie de Beaumont and Arago, who never for a moment doubted the final success of the undertaking; their confidence being based on analogy, and on a complete acquaintance with the geological structure of the Paris Basin. It may be added, that the formation is identical with that of the London Basin beneath the London Clay.

The following calculations may amuse the curious. The depth of the Grenelle Well is nearly four times the height of Strasburg Cathedral; more than six times the height of the Hospital of Invalids, at Paris; more than four times the height of St. Peter's, at Rome; nearly four times and a half the height of St. Paul's, and nine times the height of the Monument, London. Lastly, suppose all the above edifices to be piled upon each other, from the base line of the Well of Grenelle, and they would but reach within 11½ feet of its surface. Thus, for 1794½ feet:—

Strasburg. Invalids. St. Peter's. St. Paul's. Monum.
Feet, 461 + 292 + 424 + 404 + 202 = 1783—11½ feet.

I. T.

January, 1843.

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YEAR-BOOK OF FACTS.

Mechanical and Useful Arts.

COMPLETION OF THE THAMES TUNNEL.*

Sir I. M. Brunel, F.R.S., has exhibited to the British Association†, a diagram of the exterior elevation of the Thames Tunnel, and also a representation of the machinery by which he supported the roof and sides during the process of excavation. The difficulties, (observed Sir Isambard,) were very great, and deemed insurmountable by many learned and scientific men. Indeed, the difficulties were much greater than he himself had at first conceived them to be; for the ground to be excavated was quite different from that which had been brought up with an augur in the preliminary examination of it. However, he never deemed the undertaking impracticable.

Sir I. M. Brunel then directed attention to the apparatus he had devised for sustaining the arch during the progress of the works. It was upwards of 60 feet wide, by 22 feet high, divided into 12 compartments, each containing three arches, one above another. The top was horizontal. Each compartment could be moved forward or backward at pleasure, so that as the workmen excavated a few inches, the superincumbent pressure was immediately sustained by the protrusion of that part of the machinery opposite which the excavation was made. The ground was cleared away in front of each alternate division of the moveable arches, so that six were always stationary, sustaining the roof of the Tunnel; while the other six were employed in making the additional progress. Some of the strata overhead was quite dense, while part of it was in a fluid state. The workmen never advanced more than six inches at a time; and then the props were immediately introduced into the vacant place: the building up of buttresses and arches followed in the rear.

During the progress of this extraordinary undertaking, five irruptions of the river had taken place. One occurred when the Tunnel was half completed. This was in consequence of the men having struck for an advance of wages; and, during the consequent delay, a very large hole opened in the top, and the water poured in. When this occurred, (said Sir Isambard,) every one had a hole for his stopper; but he could get no one to make a stopper for the hole. By that unfortunate irruption, five men were lost. However, he succeeded in stopping the leakage, and in prosecuting the works, until he reached the opposite side of the river. He had now the pleasure to come before the public for the first time, and say the work was done. Many had endeavoured to discourage him, and to thwart the undertaking, but the Government had been exceedingly liberal: the Duke of Wellington, from the first moment that he had seen the plan, conceived a high notion of its practicability, and forwarded the undertaking as much as possible.

---

* Year by year, since 1827, or during sixteen years, have we reported the progress of this stupendous work in as many volumes, viz., Arcana of Science, 11 vols.; Year-Book of Facts, 5 vols.=16.

† The Association held their Twelfth Meeting, at Manchester, in the week commencing Wednesday, June 22.

In answer to a question from Mr. Roberts, Sir I. M. Brunel said that the quantity of water percolating at present, (July,) through the Tunnel, was about 60 or 70 gallons per minute. About six weeks previously, 480 gallons oozed through; the quantity had since been reduced as above; and in a short time it would entirely cease.

The Tunnel was opened on August 1, for the first time, on the Wapping side of the river; when upwards of 500 visitors, of all nations, passed through, as far as the shaft on the Rotherhithe shore. The Wapping shaft is about 90 feet in height, and is surmounted by a handsome dome, which is glazed, and light and air admitted. There are two staircases, one terminating close to the western arch, and the other leading to the eastern arch. The western arch only was opened for visitors. When the Tunnel is opened as a thoroughfare for foot passengers, the toll to be charged is, we understand, to be 1*d*. each person. The engine and pumps, were, in August, constantly at work in the Rotherhithe shaft, to clear the Tunnel of the accumulation of water caused by the land springs. There is a culvert under the western arch, into which the waters are collected and pumped out, which keeps that side of the Tunnel always dry: as a current of air passes through the excavation, the place is rendered comfortable; and by the aid of the gas lights, which are always burning, the temperature of the atmosphere is nearly the same as it is on shore.—*Times*.

NEW STEAM-ENGINE.

THIS engine has been erected by the Messrs. Rennie, at the extensive manufactory of Mr. Thomas Cubitt, Thames-bank. It differs in no respect, as far as regards details and arrangement, from the ordinary rotative engine of Woolf. There are the two cylinders, side by side, as of old—a small one, into which the steam first passes at a high pressure from the boiler, and a larger one into which it expands, (five times); also the ponderous beam, fly-wheel, rotating shaft, &c. The only difference we could observe consists in the workmanship, which is of a very superior description, and in a little better clothing, (perhaps) of the cylinders. The effective working power is stated to be equal to 60 horses, and the consumption of fuel to be *no more than 2·2 lbs. per horse power per hour.* So small an expenditure of fuel has never been before reached by any rotative engine, of any description; not even by the same sort of engine when in the hands of Woolf. We were assured that it was doing the same work which two or three *old engines, of the cumulative power of 60 horses*, had been in use to perform, and have no reason to question the fact.—*Mechanics' Magazine*, No. 971.

STEAM ENGINES.

Mr. T. Walker, engineer, of North Shields, has patented certain improvements in Steam-engines, the object of which is to prevent the exhausting steam of one cylinder from interfering with the other cylinder while in full power; as he conceives that when the steam of one cylinder is exhausting, it will pass through the eduction-pipe to the other cylinder, where it is not wanted, and destroy, in a measure, the power of that cylinder for a time, (the quicker the engines go, the greater will be the resistance to each piston alternately by the other's exhausting steam); to avoid this, the Patentee uses separate exhausting ways, and so prevents the exhausting steam of one from interfering in the least with the other.

Upon this, the Editor of the *Mechanics' Magazine* observes: "We really know not which to admire the most, the extreme *simplicity* of this invention, or the brevity of the specification, of which the above is not an *abstract*, but a *copy*."

STEAM-ENGINE INDICATOR.

M. Clement, the inventor of the Sillometer, has patented, both in France and this country, an instrument which indicates constantly the elasticity of the steam both in high and low-pressure engines, and the level also of the water in the boilers. This instrument may also be applied to the piston of an engine, so as to show the loss of power sustained by the steam in its way to it. A tube, similar to the Manometer, is affixed to the instrument through which the steam ascends, and is introduced into a copper or brass box placed on the deck of the vessel, and upon which a graduated dial indicates, by means of a hand, to the officer of the watch, the effects of the engine, without his having to send below to ascertain it.

AMERICAN MARINE ENGINE.

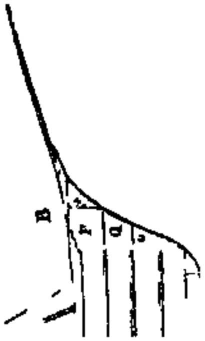
Messrs. Stillman and Co., of New York, have constructed, for two steamers built for the Spanish Government, an excellent side-lever Marine Engine. The framing resembles that by Fawcett and Co.; the ingress and egress of the steam to and from the cylinder is regulated by spindle-valves wrought by an eccentric, the rod of which has a long nut, furnished with a right and left-handed thread, so as to shorten or lengthen the rod at pleasure. There is a common expansion valve, wrought as usual.—See *Civ. Eng. and Arch. Journ.*, No. 57.

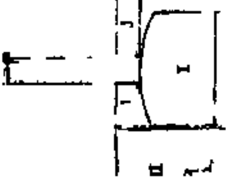
TIMBER-BUILT STEAM-VESSELS.

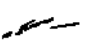
No. 54 of the *Civil Engineer and Architect's Journal* contains a complete Table of the proportions of the whole of the Timbers, with but few exceptions, used in the construction of Timber-built Steam-vessels. The Editor believes this to be the first table of the kind that has appeared in print; that it will be valuable to all parties connected with steam navigation; and become a model for forming similar tables of other vessels than those specified, which are the *Royal Tar*, *Don Juan*, and the West India Mail Packets.

NEW STEAM-VESSELS.

The following are the most important constructions of the past year, either as regards stupendous size, or novelty of principle —



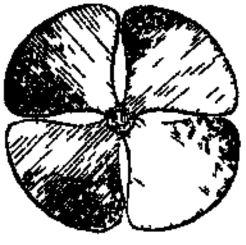


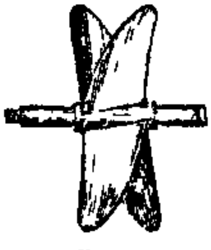


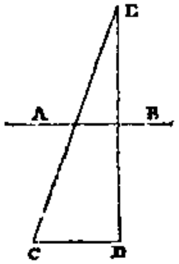
(Section of the *Great Britain* Steam ship)

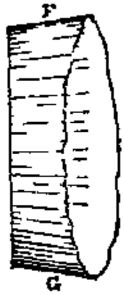
The Great Britain, iron Steam ship, nearly completed, by a Company, at Bristol, (Humphreys, engineer,) is minutely described by Mr J R Hill, C E, in the *Mechanics' Magazine*, No, 996 The cut shows a longitudinal vertical section of the entire vessel AB Surface line of upper deck CD Principal promenade and dining Saloons, 110 and 100 feet long E Cargo deck, 65 ft long by 9 ft high F Iron Fresh water tank G Coal store, and room for engineers H Elevation of Engines I ditto of boiler JJ Iron deck over boiler for cooking apparatus. K fore or second class Saloon L lower fore Saloon M & N Iron floored Cargo-decks O Air chamber, from boiler to fore bulk head P Officers' berths, &c Q Sailors' Mess room R Sailors' berths S Water closets T Ship's stern post through which the screw passes, and to which the side plates are riveted U Shaft from engines to screw V Diagonal stay from the ship's side to the sternpost, in which the end of the screw spindle revolves X Keel under the screw, uniting the stern post to the vessel Y Hollow rudder foot to receive the stern post which forms its pivot Her main dimensions are, length of keel, 289 feet, from figure head to taffrail 320 feet, beam, 51 feet, total depth 31 ft 4 in tonnage, about 3,500 tons The hull is divided into 5 distinct compartments by water tight iron bulk heads the decks, of wood, are the cargo two cabin and an upper her lines are very beautiful, and adapted for the highest speed and, although, perhaps she is the strongest vessel ever built, she has a remarkable air of grace and lightness Her engines will be 1000 horse power she will accommodate 490 persons, and there are to be six masts She is to be propelled by the Archimedean screw, shown in the first and second of the annexed figures Mr Hill states "allowing the diameter to be fifteen feet, the diameter of the circle of effect would be about 12 feet 6 inches, or about 39ft 6 inches circumference therefore the mechanical constructions, if developed to a straight wedge, would be represented by AB, in the third figure line of axis CD, distance passed over by one revolution, (19ft 2in) DE, circumference of circle of total effect, and CE, acting face of the screw

The amount of resistance caused by the adhesion of the water on the face of the screw will very much depend on the smoothness of the surface; or probably, a thin disc of water will be carried round with the screw, and the friction take place amongst the particles of water at some slight distance from the face, I G, (in the next fig.) shows the divergent lines of the cone of motion communicated to the water, and if the above premises be correct, it appears to promise a greater effect than has generally been expected, inasmuch as the direction of impact of the screw does not make so great an angle from the line of the axis."









The Great Northern, built at Londonderry by Coppin, is fitted with Smith's Archimedean screw, and is one of the largest vessels to which that principle has been hitherto applied. Her dimensions are:—Extreme length 247 feet; length between perpendiculars 222 feet; extreme breadth 37 feet; depth in hold 26 feet; draft of water 16 feet, with a dead weight of 1,300 tons, consisting of coals, ballast, machinery, &c. The diameter of the cylinder is 68 inches, the length of stroke 4 feet 6 inches, and the number of strokes per minute 17; the diameter of the propelling screw is no less than 11 feet. The *Great Northern* is frigate-built, pierced on her upper deck for 44 guns, and fully rigged as an ordinary sailing vessel. The main mast is 90 feet high, and its diameter 33 inches. The length of main yard 79 feet, and the diameter 22½ inches. When in full sail, she spreads no less than 6,700 yards of canvas. Her speed under steam power only is nine and a half statute miles per hour. Her machinery is near the stern, leaving the hold entirely free for mercantile purposes, and the boilers and furnaces are all placed below the water-line. The machinery occupies about one-sixth of the tonnage of the vessel. The consumption of fuel is about one ton per hour, and with six hundred tons of coals on board, she will take in one thousand tons of measurement goods, and accommodate between decks eight hundred troops.

The Cormorant, (Government) Steam frigate is fitted with a pair of engines of 300-horse power, by Fairbairn and Co. The diameter of the cylinder is 65½ in., and length of stroke 5ft. 3 in.; the average number of strokes, during trial, was 21½, the boilers amply generating steam; speed through still water, 11 miles per hour, but greater speed will be attained.

The Montezuma Steam-frigate,—built for the Mexican Government by Wigram and Green, has engines of 300-horse power, on a similar principle to those on board the *Gorgon*, *Driver*, *Styx*, &c., by Seaward and Capel. Her burden is 1,100 tons, but she draws no more than nine feet water when fully equipped; and is built to carry two swivel guns, 68-pounders, on the upper deck, besides the usual number of small guns. Although constructed rather for fighting purposes than for speed, she steamed at the rate of 10½ miles an hour, against tide both ways, the engines making 21 strokes per minute. She has a new disconnecting apparatus, for releasing paddle wheels.

The East India Company's Steam-frigate *Acbar*, is of the first class, armed with two eight-inch guns, and four long 32-pounders, with a complement of 160 men; carrying five boats, on two of which are mounted brass 12lb. howitzers. The engines are of the collective power of 350 horses, by Napier, of Glasgow. She carries 500 tons of coal, which, with a consumption of a ton an hour, will enable her to steam 20 successive days.

The Hindostan, of 1,800 tons burden, built by Messrs. Wilson, of Liverpool, for the Oriental Steam Navigation Company, is intended to ply between Suez and Calcutta direct, calling at Aden, and Point de Galle, in the island of Ceylon, so that the whole distance from England to Calcutta will be performed in 30 days. Though larger than the *Oriental*, the *Hindostan* is on precisely the same plan, and another steamer, of the same size and construction, to be called the *Bentinck*, also intended for the line from Suez to Calcutta, is in progress.

The Guadaloupe, built for the East India Company's navy, is the largest *iron* Steamer yet constructed. Her length from the figure-head to the taffrail is 201 feet, and her breadth of beam 30 feet 1 inch, and her tonnage, per ad measurement, nearly 800 tons She only draws 9 feet of water, with provisions and water for 120 men and 10 days' coal on board. She carries two large pivot guns, one forward and the other aft, 68-pounders, on sliding carriages of oak, the under frame working on circular rails of brass, secured to the deck The weight of each gun, including the carriages, is from 5½ to 6 tons. She is brigantine-rigged, and is a very handsome vessel.

The Memnon Steam-frigate, (E. I C) of 1,100 tons, mounting two 64-pounders and four 32-pounder guns, has been built by Fletcher, and fitted with engines of 400-horse power by Maudslays and Field The boilers, which are of copper, are furnished with a change-water apparatus, by which the salt water is kept from exceeding a certain point of saturation. There are four steam cylinders working in pairs, the piston-rods being attached to a T-piece, from the lower end of which a long connecting-rod proceeds up to the main crank-shaft. The engines are fitted with expansion gearing, so as to admit of the consumption of fuel being regulated to suit every circumstance of slow or quick steaming The paddle-wheels, 26 feet in diameter, are fitted with the disconnecting gear by Maudslay The engines work with a beautiful motion, the vibration being scarcely perceptible The vessel, with her heavy cargo, with 300 tons of coals, is propelled by steam alone at 11½ miles per hour.

The Trent West India Mail Steam-ship has engines of 430-horse power, by Miller and Ravenhill, diameter of cylinder, 74 inches, length of stroke, 7 feet. The condenser, cylinder bottom, air-pump bottom, and support for the main centre, are cast upon the foundation-plate The framing has metallic joints, and brass and copper are unsparingly substituted for iron. The engines work very smoothly, with a consumption of only 16 cwt of coals per hour; with a pressure in the boiler of only 3 78 lbs per square inch, the mean pressure on the piston is only 14 17 lbs per square inch The difference between the vacuum in the condenser and the vacuum, is only 28 lbs. of pressure per square inch.—*Civ. Eng. and Arch Journ.*, No 55.

The Queen iron Steamer, built by Pasco, has engines by Messrs. George and Sir John Rennie. She is 160 feet long between perpendiculars, of 16 feet 6 inches beam; 8 feet 9 inches deep, and draws about 4 feet 3 inches water; her cylinders are 29 inches in diameter, and the length of stroke 4 feet 5 inches, the average number of strokes per minute, 34; pressure of steam in boiler 8 lbs.; the condenser vacuum, equal 27½ inches mercury, the diameter of paddle-wheels 16 feet 6 inches, width of ditto, 8 feet, her speed about 16 miles per hour, with the entire absence of vibration in the vessel.—*Mechanics' Mag.* No. 993.

The Little Western, built at Bristol, by Acramans, Morgan, and Co., of 721 tons burthen, measures between perpendiculars 200 feet, and over all 216 feet; keel admeasurement, 195 feet, breadth clear of paddle-boxes, above 27 feet;

over all, exceeding 47 feet, deck, flush from stem to stern, and she has two masts. Her engines are horizontal and low-pressure, and 80-horse power each. Her trial speed was nearly 15 miles per hour.

The Anti John Scott Russell is a small iron vessel, 58 feet long, by 6 feet beam, and 8 feet 3 inches deep, and draws 17 inches at stern, and 13 inches fore, or 15 inches mean. The paddle-wheels are 6 feet 5 inches diameter, out and out, with 10 float-boards on each wheel, 2 feet 9 inches, by 7½ inches She is propelled by *one* rotatory steam-engine, patented by Beale, the cylinder 14 inches diameter, and 9½ inches long, (measured transversely,) in the clear of the casing. The drum is 12 inches diameter, with 3 indents for 3 rollers, 4½ inches diameter, and 9½ inches long, which perform the office of piston At the top is the steam-pipe when the aperture is opened, the steam passes down the pipe, and acts against the back of the roller, pressing it forward until it reaches the aperture on the opposite side, where the steam is allowed to escape into the eduction-pipe, and thence into the condenser. The apertures are always open—one for the reception of steam, the other for its exhaustion. The admission is regulated by a throttle-valve in the steam-pipe, before it enters the casing of the engine The reversing of the engine is extremely simple it is done by turning a screw, or by a lever, which pushes forward the D slide-valve, when it reverses the flow of the steam, which passes through the cylinder The engine generally makes from 250 to 300 revolutions per minute, by which rapid motion the centrifugal force causes the rollers to press against the outer casing, and allows the steam to act upon the back of them, as before explained To the engine of the above boat there are two air-pumps, 8 inches diameter and 11 inches stroke The condenser forms a pedestal in the bottom of the boat, upon which the engine and pumps are placed The boiler is as compact as the engine it is cylindrical, 2 feet 6 inches diameter, and 7 feet high over all and contains numerous tubes about one inch diameter, and an inch apart, through which the heat and smoke pass from the furnace to the chimney immediately over. The area of the grate is about 4 square feet, or half a foot per horse, the water occupies only a very small height of the boiler, the other portion forming a receptacle for the steam, which is usually generated to a pressure of from 40 to 50 lb in the boiler. The consumption of coke is stated to be about 60 lbs per hour, depending upon the speed The air for the supply of the furnace is driven in by the aid of a fan. Motion is communicated to the paddle-wheel by a pinion-wheel on the outside of the shaft or axis of the engine, which drives a larger wheel upon the shaft of the paddle-wheels, in the proportion of 1 to 4½, so that when the engine makes 270 revolutions per minute, the paddle-wheels make 60 revolutions The total weight of the engine, condenser, air-pumps, paddle-wheels, boiler, and water, is 2½ tons In a trial trip, this boat has performed 7 miles in 37 minutes, with the tide The engine is very simple, compared with previous patents of the same kind, is very powerful in working, and must be very economic in construction, particularly when used as a non-condensing engine Besides the engine on board the "Anti John Scott Russell," Mr. Beale has one of a similar size and description at his manufactory at East Greenwich, worked at the low pressure of 4 lbs to 6 lbs, it stands on the ground, and is hardly perceptible among the numerous machinery in the shop, although it drives the blast-fan of a foundry, and sets in motion numerous lathes, planing machinery, &c —*Civ. Eng and Arch. Journ.*, No 57, *abd.*

The Atmospheric, built by Ditchburn and Mair, is entirely of iron in the hull, but with deck and fittings of timber, and is for river navigation. Her length between perpendiculars is 150 feet, breadth of beam, 18 feet, depth of hold, 9 feet 9 inches, draught of water, 4 feet 8 inches her engines, 365-horse power, by Seaward and Capel, are upon the old atmospheric principle, they work most efficiently, and the boat is of unrivalled speed.

The Locomotive, No 1, for running between the Adelphi Pier and Greenwich, is fitted by Braithwaite and Co, with a locomotive engine, the same as those working on railways, except that it is taken off its wheels, and set upon bearers laid across the bottom of the boat, and instead of the railway wheels, there are fixed upon *each* end of the driving or cranked axle, a pinion-wheel, 2 feet 4 inches diameter, which works into a cog-wheel 7 feet diameter, keyed on to the shaft of the paddle-wheels, the shaft being one piece, with a bearing in the centre on the top of the boiler. The engine is 10 tons, with two cylinders 12 inches diameter, and 18 inches stroke, the pistons making from 100 to 130 revolutions per minute. The length of the boat, of iron, is 108 feet on the water line, beam 11 feet 6 inches, drawing 2 feet 2 inches when light. The speed is equal to about 12 miles through the water, and the consumption of fuel is about the same as on railways. As the engine is fixed in the boat, instead of moving at such high velocities as it does on rails, there is nothing like the same wear or liability to derangement.—*Civ Eng and Arch Journ*, No 59.

Il Peloro is a compact steam vessel, built by Pitcher, for the Neapolitan Government, for conveying the mails. Her dimensions are 130 feet in length between perpendiculars, 19 feet 6 inches in moulded breadth, and 20 feet 2¼ inches extreme breadth; burthen, 252 tons; pair of 50 horse engines by Bolton, Watt and Co; cylinders 3 feet 3¼ inches diameter, and stroke 3½ feet; paddle wheels 15 feet 6 inches diameter; average speed, 10½ miles per hour, with a very small consumption of fuel. The indicator figures show a vacuum of 12 to 13 lbs, with a pressure of 3½ lbs of steam.—*Civ Eng and Arch Journ*, No 56.

Portable Steam Tug.—Captain Carpenter, of the *Geyser*, has had her pinnace fitted with his own patent propeller and a small engine of 5 or 6 horse power from the Disc Company. The pinnace is 30 feet in length, 9 feet wide, and is capable of carrying 8 tons. The disc engine with which she is fitted weighs altogether but 6 cwt, and measures 3 feet by 1 foot 6, leaving ample space for a full complement of men. The connexion between the engine and the propellers is by means of grooved pulleys and catgut bands. The velocity of the engine shaft was 200 revolutions a minute, and more than that is not, we understand, desired from the propelling shafts. The engine and boiler are so fitted to the pinnace that they can be taken out in five minutes, and replaced ready for operations in the same brief space of time.

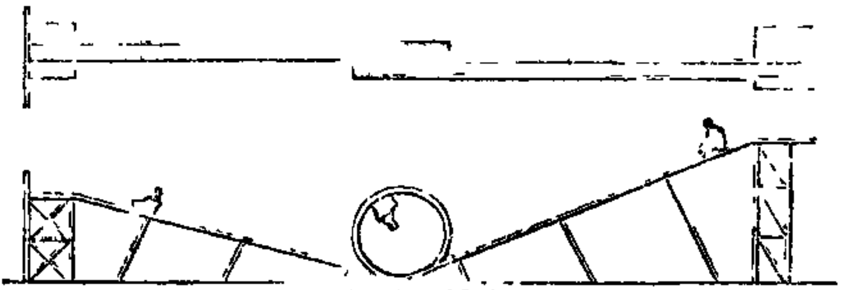
ATMOSPHERIC RAILWAY

THE Report on this invention, of Sir F Smith, R E, and Prof Barlow, has been presented to Parliament. The summary of their opinion is thus given: "1 That we consider the principle of Atmospheric propulsion to be established, and that the economy of working increases with the length and diameter of the tube. 2 That the expense of the formation of the line in cuttings, embankments, bridges, tunnels, and rails will be very little less than for equal lengths of a Railway to be worked by locomotive engines, but that the total cost of the work will be much greater, owing to the expense of providing and laying the atmospheric tube, and erecting the stationary engines. 3 That the expense of working a line on this principle, on which trains are frequently passing, will be less than working by locomotive engines, and that the saving thus effected will, in some cases, more than compensate for the additional outlay, but it will be the reverse on lines of unfrequent trains. However, there are many items of expense of which we have no knowledge and can form no opinion, such as the wear and tear of pistons, valves, &c, on these further experience is wanted. 4 That with proper means of disengaging the trains from the piston in case of emergency, we consider this principle, as regards safety, equal to that appertaining to rope machinery. There appear, however, some practical difficulties in regard to junctions, crossings, sidings, and stoppages at road stations, which may make the system of less general application."

Mr Brunel has become a convert to the merits of this Railway, so far, at least, as to recommend it to be the only practicable method of establishing a railway communication from Genoa, through the passes of the Appenines. The Prussian Government have had it under their consideration to give it a trial in a part of its Rhenish provinces, where the actual character of the country opposes similar obstacles to the laying down of railways on the ordinary plan, and have consulted Mr. Vignoles on the subject. At some experiments made on Wormholt Scrubbs, where about half a mile of railway on the atmospheric plan has been for some time laid down, a speed has been obtained with a vacuum varying from 24 to 25 inches of mercury, or upwards of 40 miles an hour; and this, notwithstanding the rails are out of condition, and the atmospheric appliances not much better.—*Mechanics' Magazine*, No. 983.

CENTRIFUGAL RAILWAY.

Messrs. Hutchinson, Higgins, and others, have registered the design of a Centrifugal Iron Railway, the annexed engravings of which are copied and reduced from those deposited at the Registration Office. The railway has been exhibited in operation in London and Liverpool. From the *Liverpool Courier* of April 20, its first exhibition in that town was as a small model, in which a tiny iron carriage was made to run down an inclined plane, traverse an iron circle, and ascend an inclined plane on the opposite side. At the theatre, the railway was subsequently exhibited in full operation. "A carriage sufficiently large to hold a man or a woman, is loaded with heavy weights, and dispatched down a plane which reaches from the upper portion of the gallery down to the orchestra; here, by its own impulse, it traverses a vertical circle of 40 feet diameter, and the remaining force is expended in carrying it forward up another slope, which reaches to the back of the stage. The journey having been performed with fifty-six pound weights, a bucket of water, &c., without either of the weights or a drop of liquid having been displaced, a young man, and subsequently a young lady, entered the car, and each performed the apparently perilous journey in perfect safety, and without the slightest inconvenience. The exhibition is exceedingly curious, and well worthy the attention of the public."



(The Centrifugal Railway.)

"The principle of the thing is well known; though the application of it, enabling people to travel with their heels uppermost, is, doubtless, new."—*Mechanics' Magazine*, No. 978.

NEW RAILWAY SIGNAL.

On March 16, was explained to the Society of Arts, by Mr. B. Rotch, V.R., a new Danger Signal for Railways. All signals addressed to the eye are liable to be obscured by fogs, and require constant attention on the part of the engine-driver. It is not so with signals addressed to the ear. The plan therefore proposed is, to provide for the various stations, and for the guard of each train, a light wooden arm, or trigger, which, on being placed on any quarter mile post fitted to receive it, and gauged to the rails, will, as the train passes, lift the handle of the steam-whistle, and thus give the driver notice at once to stop the engine; so that if part of a train should be separated from the rest, the guard will only have to return to the quarter mile post last passed, and put up the trigger, which will give notice of danger to the next coming train in time to stop. In the same way, the officers at a station, wishing to stop a train, have only to send a man with a trigger to any quarter mile post where it is desired a train should be stopped, instead of the present imperfect plans now in use. One advantage of this plan over any other yet proposed is, that it puts it out of the power of any ill-disposed persons to give false alarms, as the triggers must be accurately gauged to lift the handle.—*Athenæum*, No. 751.

PROGRESS OF RAILWAYS.

The total extent of new Railways brought into operation between November 1, 1841, and the same month in 1842, is about 176½ miles; or about 70 miles less than in the previous year. Among the more important works are the following Tunnels, completed or in progress:—

The Blechingly Tunnel, upon the South-Eastern and Dover Railway, is completed: it is nearly three quarters of a mile in length, 24 feet wide, 21 feet high, and of elliptical figure. The work was carried on by twelve shafts of 9 feet diameter, by which 264 yards were begun and completed in a month. The bricks were made on the spot; 13 millions in three months. The greatest number of men employed in this work at one time was about 1000.

The Saltwood Tunnel, on the South-Eastern Railway, in the lower green sand stratum, contained an immense quantity of water, and is of dangerous construction; but the adit is formed completely through the hill, so as to let all the water run out at one end, where nearly 30,000 gallons of water flow every hour; and about 30 million gallons of water were drawn to the surface during the time the workmen drew 3500 yards of earth, or about 30 times the weight of water compared with the earth.—*Civ. Eng. and Arch. Journ.*, No. 65.

The Tunnel on the line of the Sheffield and Manchester Railway will be three miles in length, upwards of 600 feet below the surface or summit of the hill at its greatest height, and in rock formation throughout its entire length. The works, projected by Vignoles, have been two years in progress.

THE BOX TUNNEL, ON THE GREAT WESTERN RAILWAY

MAJOR-GENERAL PASLEY, Inspector General of Railways, has examined this stupendous work, and reported its state to have been as follows, on August 11

The Major was accompanied by Mr Merchant, an assistant-engineer under Mr. Brunel, who provided workmen with ladders, torches, and tools, and by Mr Brewer, who executed as contractor all that part of the tunnel which has been cut out of the Bath freestone, geologically termed the great oolite formation, and which it was not deemed necessary to secure by masonry or brickwork. The Report proceeds thus —

"The Box Tunnel has been laid ont with a gradient of one foot in 100, ascending from west to east, but the natural strata of the oolite dip longitudinally at about the same inclination in a contrary direction, whilst transversely they are very nearly horizontal, the south side being, perhaps, a little lower than the other The thickness of the strata varies from about two and a half to four feet and upwards These are intersected by vertical fissures, of such moderate width as can scarcely be appreciated, but of considerable height, and generally at right angles or transverse, though in some few cases oblique in reference to the line of the tunnel

"At the eastern entrance, a small portion of the Box Tunnel has been arched over and lined with masonry, after which, for about half a mile in length, the natural rock has been considered sufficiently strong, without masonry or brickwork, and whilst the extreme width of this portion of the tunnel is about 30 feet, the height varies from about 30 to 40 feet I examined all the vertical fissures that appeared suspicious, going up by a ladder, and striking the rock on each side of them with a hammer, or iron rod, and as it everywhere emitted a clear sharp sound I consider it to be sufficiently solid, a hollow dull sound being the symptom of danger The sides of the tunnel are cut in the form of an oblong elliptical, or nearly a Gothic arch, the uppermost bed of the oolite has not been completed in that form, but left horizontal for two or three feet in width, and, in consequence of the line of the tunnel and the inclination of the strata intersecting each other, as above described, this upper part of the tunnel has been cut in the form of steps, in order to get rid of the thin wedge-shaped form of those parts, in which each successive stratum would have terminated, if the tunnel had been made of uniform section throughout, which portions would, of course, have been weak, and liable to exfoliate. The cause of varying the height of this part of the tunnel as before mentioned, was to avoid finishing in any lower stratum of a doubtful nature, which in the sides might be perfectly strong, but not so trustworthy in the roof

"From the description which I have given, it will be understood, that the upper strata of the oolite, being supported by those below them, (beyond which they each successively project in a moderate degree, like corbels in architecture,) the whole enter into that sort of combination which has the strength of an arch without its form, provided that the vertical fissures do not cut through them longitudinally, of which I could not see any symptom; but as I said before, there were a number of transverse fissures, which can evidently do no harm; whilst the oblique ones, less satisfactory than the latter, are by no means so dangerous as the former might be.

"In order to judge more accurately of the great oolite formation in the Box Tunnel, I next proceeded to examine three several quarries of that stone in the same hill: first, the lower hill quarry, of considerable extent underground, which we explored by lights. The roof has been every where left flat and nearly horizontal, according to the natural level of the strata. The distance between the sides of the excavation, or between square pillars left here and there to support it, varies from about 10 to 20 feet across, and to as much as 29 feet if measured diagonally. There are vertical fissures of considerable height in the spaces alluded to; but Mr. Brewer, who is an elderly man born in the neighbourhood, assured me that those parts which I examined in company with him, have remained in the same state ever since he can remember. I afterwards examined Mr. Skell's quarry, in which there were men at work, and I observed in one part of the flat roof a fragment of stone about 15 feet long by 5 feet in width, surrounded by an irregular vertical crack, entirely unsupported by the sides of the excavation, which were about 8 feet apart. Afterwards I examined the Box field Quarry, at the summit of the hill, which is now worked by Mr. Brewer to the depth of about 100 feet: into this the workmen descend, and the stone is raised by means of several shafts, two of which are very near to each other; and all round, as well as between these two shafts, the flat roof of the quarry is intersected by a complete network of vertical cracks cutting through the horizontal strata in a manner that to an observer unacquainted with the nature of this rock would appear extremely dangerous, as the portions of the roof bounded by these fissures have no apparent support; and I should not like to see a roof of the tunnel in such a state. Mr. Brewer declares that they have remained in this condition for the last twenty years; and it is certain that there are men constantly at work at the bottom of this quarry, who can, of course, have no apprehension as to their own personal safety.

"I am, therefore, of opinion that the portion of the Box Tunnel which has been excavated through the great oolite, having the form of an elliptic or Gothic arch, is much stronger and safer than the flat roofs of any of the quarries; and taking into consideration that the latter have stood for years, though intersected by a network of vertical cracks, from which the tunnel is free, I sincerely believe that that portion of the Box Tunnel which is unprotected by masonry or brickwork is perfectly strong and safe; and that any opinion to the contrary must have been hastily formed, without that minute and accurate examination and comparison of the said portion of the tunnel with the adjacent quarries of the same sort of stone, in the same hill, which I thought it my duty to make.

"In respect to the supposed injurious action of the concussion of the air produced by locomotive engines in passing through this tunnel, which has been held out as likely to endanger the safety of passengers in the unarched parts of it, I beg to state, that during the time that I was examining the Box Tunnel, which occupied several hours, two passenger trains and one luggage train passed; and, in order to ascertain their effect, I stood within three or four feet of them whilst passing, without the smallest personal inconvenience, though they were much nearer to me than to any part of the rock above them. The passenger trains produced a moderate breeze of wind, the luggage train rather a stronger breeze in passing, but neither capable of having any effect on the roof of the tunnel; for I think it will be admitted that any power capable of throwing down a stone or mass of rock from the roof, at a certain distance, would with greater ease have thrown down a man standing at a smaller distance.

"The remainder of the Box Tunnel passing through fuller's-earth and clay below the great oolite formation in its centre, and afterwards through the inferior oolite towards its western extremity, has been arched over with brickwork, complete throughout its whole extent, varying in thickness from four to seven concentric rings of that material, and as much as nine at the western entrance, whilst, in every part except where the oolite formed the foundation or bottom of the tunnel, an inverted arch has been introduced. In some parts, a portion of the side walls have been formed of the inferior oolite unprotected by brickwork, but no part of the roof has been formed of this substance, in which Mr. Brunel and his assistants placed little confidence.

"Upon the whole, I consider that the Box Tunnel has been constructed with great judgment, and that it would have been a useless and prodigal expense to have introduced brick arches in those parts of it which are cut out of the great oolite rock. This formation may, perhaps, greatly vary in quality in different parts of England or of the world, but that which is intersected by the Box Tunnel requires no support. Small exfoliations may or may not take place in winter, but as all tunnels, deep cuttings, and high embankments, are carefully watched on well-regulated railways, no risk to the safety of passenger-trains can be apprehended from such exfoliations.

"I examined also with great attention the brickwork and masonry of the other parts of the Box Tunnel, which are of good materials and well executed, all the brickwork having been built with blue lias lime mortar of excellent quality, but though this mortar is in common use, and approved by civil engineers, I must confess that I would myself have preferred cement for those small portions of the brickwork which are generally in a damp or wet state, and from which stalactites or a coating of dissolved lime are to be seen on the surface. In some very small portions of the side walls, I found that common lime mortar of inferior quality had been used; but this occurred in parts only of very secondary importance."

Yet, Dr. Buckland, at a late meeting of the Institution of Civil Engineers, stated that he considered "the Box Tunnel, as well as several others, to be in a very dangerous state, and that if they were not masonried throughout, he would stake his reputation that, at some period, not far distant, a serious fall of earth and rock will take place, the disastrous consequences of which no man can venture to enumerate." "The Doctor further laid it down as a general rule, that every tunnel which is not made through solid rock, is unsafe, unless defended by strong brick or stone-work, with provision besides for good drainage—a category which may be said to comprehend nine out of ten of all the railway-tunnels in England."—*Mechanics' Magazine*, No. 983.

THE MENAI LIGHTHOUSE.

THE Menai Strait is peculiarly fitted for a harbour of refuge for vessels entering the Rivers Dee and Mersey from the north; and the increasing number of ships frequenting this navigation, as well as the insufficiency of its beaconage, rendered it desirable that the entrance should be distinctly marked the Corporation of the Trinity House, accordingly, decided, in 1834, to effect this object by the construction of a Lighthouse, to be situated on a sunken rock about two-hundred yards from the Anglesey coast on the west side of the entrance, which is divided by the Puffin Island into two channels, defined by a beacon and two buoys.

The principal novelty in the construction of the lighthouse is the base, which, instead of diminishing, like the Eddystone, with a regular curve, recedes by a series of rectangular offsets the object of this form of structure is to break the force of an impinging wave, and prevent the whole effect of its shock being thrown upon the upper part of the building, as it is when guided up by the curved surface.

The building, which was designed by Messrs. Walker and Burgess, is a handsome circular tower seventy-five feet high, forty feet in diameter at the base, and twenty feet six inches diameter at the top, terminated by a castellated parapet, and entirely constructed of Anglesey marble. The base of the building is solid to the height of twenty-two feet six inches from the rock, diminishing at intervals of two feet three inches by offsets of nine inches each, up to six feet nine inches above high-water mark, where its diameter is twenty-two feet. On that level is the entrance doorway, which is accessible by steps cut in the base-stones. The interior contains six floors, forming rooms for the use of the light-keepers, stores, &c. Every precaution has been taken to render the exterior joints of the courses water-tight each stone is secured to that below it by a slate joggle, and two oak trenails, passing entirely through it, and entering eight inches into the lower stone. On the upper bed of each course of stones is a projecting fillet, which fits into a corresponding groove in the under side of the course placed upon it, in order to prevent the water from being forced between the courses. The two upper courses project internally and externally to form a gallery, which supports the parapet and the lantern, the foundation and the framing of which are of cast-iron. The wall diminishes gradually in thickness from six feet nine inches to two feet

The light is a stationary, red, dioptric light of the first order, without mirrors. The burner consists of four concentric wicks, of which the largest is three and a half inches diameter its ordinary consumption of oil is one pint per hour. The various bearings are given from which the light is visible at sea After deducting all expenses, the surplus revenue derived from the light dues, during the year 1840, is stated to have been £388 13s 3d.

The lighthouse is connected with the shore by a foot bridge, which consists of a platform two feet three inches wide, supported upon a series of iron columns placed ten feet apart, secured into the rock and strengthened by stays. This slight construction has withstood the violence of the waves for three years —*Communicated to the Institution of Civil Engineers, by Mr. D P. Hewett, April* 5.

THE MAPLIN SAND LIGHTHOUSE

ON May 24, Mr. J. B Redman described to the Institution of Civil Engineers the construction of the Maplin Sand Lighthouse, at the mouth of the river Thames. In the year 1837, a survey was made by Mr Walker, the engineer to the Trinity House, and by boring it was ascertained that the first six feet of the sand was close and compact, but below that for twenty feet the boring-rod went more easily as it descended, and it was found that it became mingled with argillaceous earth as the depth increased.

It was then decided to use for the foundations Mr. Mitchell's screw moorings, and in 1838, the patentee, under Mr Walker's directions, commenced fixing nine cast-iron screws of four feet diameter, so as to form an octagon with one screw in the centre attached to each of these screws was a cast-iron pile five inches in diameter and twenty six feet long, which was inserted into the sand twenty-one feet below low-water mark On account of the constant shifting of the sand from around the piles, it was determined to place a raft or grating of timber around and between them the surface of the raft was covered with faggots of brushwood well fastened to the timbers, and upon them was deposited one hundred and twenty tons of rough Kentish ragstone by this means, the raft was secured in its situation, and after a time no further changes occurred in the level of the surface of the sand.

In the summer of 1840, the superstructure was commenced it consists of nine hollow iron columns or pipes, curved at the top to a radius of twenty-one feet towards the centre, they were secured upon the piles, and two series of continuous circular horizontal ties bound them together, while they were connected with the centre column by diagonal braces—all of wrought iron Upon these columns is built a wooden dwelling for the light-keepers, in the upper part of which is placed a French dioptric light of the second order, its centre being forty-five feet above the mean level of the sea, and at that elevation it can be seen from a ship's deck at a distance of nine or ten miles, a bell is fixed on the gallery, which is sounded by machinery at intervals during dark and foggy nights.

The communication gives all the details of the dimensions and the mode of fixing the cast-iron screws and piles, made by Messrs. Rennie—the iron-work, by Messrs. Gordon of Deptford—the wood-work by Messrs. Gates and Horne of Poplar, and the lantern, by Messrs. Wilkins.

NEW EGYPTIAN LIGHTHOUSE.

Mehemet Ali has caused a new Lighthouse to be erected on Point Eunootos, near his palace at Alexandria. The tower is of stone, and 180 feet high, the lantern, (supplied from England, by Messrs. Wilkins and Son,) consists of thirteen lamps, with parabolic reflectors. The light can be seen from a distance of twenty miles at sea. The structure was designed by, and has been executed under the superintendence of, our countrymen, the Messrs. Galloway.

"THE LIGHT FOR ALL NATIONS."

We regret not to have to record the execution of the bold design of fixing a Light upon the Goodwin Sands, by its enterprising projector, Mr. Bush, who has not succeeded in sinking the caisson, or base. Meanwhile, the details of this portion of the Light may be acceptable, in addition to the brief notice of the design in our last *Year-book*, p 55

The caisson may, in one point of view, be described as an enormous diving-bell, as far as affording the means of working under water to an extent hitherto unattempted. But, it is something more It is a diving bell which, by excavation, will enable these operations to be pursued, to any depth, through the water, and even through the semi liquid sand Unlike the diving-bell, when brought to its situation and permanently sunk, and the period of its office over, this caisson becomes part and parcel of the very foundation which, in the first instance, it was intended to accomplish; for its void will then be filled in with solid masonry, upon which the superstructure will hereafter be erected

The caisson is composed of cast-iron plates, of a conical shape, thirty feet diameter at the base, the upper diameter being twenty-five feet, and thirty feet in height. These plates are arranged in courses or tiers, each six feet high, and twenty-four plates in each tier. The whole of the horizontal and vertical joints are connected together with flanches and bolts; and afterwards with iron-cement, through the joints, to render the machine perfectly air and water tight. The section is divided into three chambers. In the lower chamber, the work of excavation will be carried on This chamber has a domed top, with a covered aperture or air-tight valve, four feet in diameter in the centre, communicating with the chamber above. The second chamber has an upward and external communication by means of a cylinder, four feet in diameter, also covered by a valve, to be opened as required. This chamber is fitted with air-pumps, valves, and air-gauges, to obtain and regulate the necessary supply of air for the workmen during the progress of the works For the supply of air, another difference will be apparent from the process employed in the common diving-bell for, instead of the air being forced down from above according to the usual method, the pumps stationed below draw the air from above, with all the pressure of the atmosphere in favour of their action, instead of forcing against it. As the process of excavation is carried on in the lower chamber through this cylinder, the sand and soil removed will be discharged over the top of the aperture into the sea, and the gradual sinking of the caisson effected by its removal.

The third, or upper chamber, is covered air and water tight, excepting by means of the valves, through which air is supplied, and is fitted as a residence for the workmen during the progress of the works. The caisson being sunk, the work of excavation will be commenced. This will be carried on in a similar manner to that pursued with the kit of a well, or rather as were the shafts at the entrance to the Thames Tunnel, with the only difference that these are on land. The workmen, however, in each case, are stationed within the cylinder, where they excavate, and, by their operations, and the removal of the soil, the gradual sinking of either shaft or caisson is effected, proceeding downwards until a solid foundation is obtained. The surface will then be levelled, and the lower flanch of the caisson brought to a permanent and solid bearing. After this process has been completed, the masonry will commence, and the whole central contents of the caisson will be filled in with solid masonry, which will be further protected by the outer coating of cast iron. The conical form of the caisson thus embedded in the sand which will silt in upon it, it is concluded, will secure the whole body firmly.

IMPROVEMENT OF LIGHTHOUSES.—LIGHTS IN RAPID MOTION.

Mr. ALLAN STEVENSON has experimented with the apparatus by which Captain Basil Hall proposed to increase the intensity and power of fixed Lights for Lighthouses, to such an extent as to render their constant effect little inferior to that of the bright flashes which alternate with the dark intervals in revolving lights.*

Mr. Stevenson has repeated Capt. Hall's experiments, and has also made some others which appeared to him to bear on the subject. Captain Hall, however, made all his comparisons at the short distance of 100 yards; whereas, Mr. Stevenson arrived at his conclusions by comparing the lights from a distance of 14 miles; and he describes them briefly in the following order:—

"1. The flash of the lens revolving slowly was very much larger than that of the rapidly revolving series; and this decrease of size in the luminous object presented to the eye, became more marked as the rate of revolution was accelerated, so that, at the velocity of 8 or 10 flashes in a second, the naked eye could hardly detect it, and only a few of the observers saw it; while the steady light from the refractor was distinctly visible.

2. There was also a marked falling off in the brilliancy of the rapid flashes as compared with that of the slow ones; but this effect was by no means so striking as the decrease of the volume.

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* For the details of Captain Hall's apparatus, see Year-Book of Facts, 1841, p. 93.

3. Continuity of impression was not attained at the rate of 5 flashes in a second, but each flash appeared to be distinctly separated by an interval of darkness; and when the nearest approach to continuity was made, by the recurrence of 8 or 10 flashes in a second, the light still presented a twinkling appearance, which was well contrasted with the steady and unchanging effect of the cylindric refractor.

4. The light of the cylindric refractor was, as already stated, steady and unchanging, and of much larger volume than the rapidly revolving flashes. It was not, however, so brilliant as the flashes of the quickly revolving lenses, more especially at the lower rate of 5 flashes in a second.

5. When viewed through a telescope, the difference of volume between the light of the cylindric refractor and that produced by the lenses, at their greatest velocity, was very striking. The former presented a large diffuse object of inferior brilliancy, while the latter exhibited a sharp pin-point of brilliant light.

Upon a careful consideration of these facts, it appears warrantable to draw the following general conclusions:—

1. That our expectations as to the effects of light, when distributed according to the law of its natural horizontal divergence, are supported by observed facts as to the visibility of such lights, contrasted with those whose continuity of effect is produced by collecting the whole light into bright pencils, and causing them to revolve with great velocity.

2. It appears that this deficiency of visibility seems to be chiefly due to a want of volume in the luminous object; and also, although in a less degree, to a loss of intensity; both of which defects appear to increase as the motion of the luminous object is accelerated.

3. That this deficiency of volume is the most remarkable optical phenomenon connected with the rapid motion of luminous bodies, and that it appears to be directly proportional to the velocity of their passage over the eye.

4. That there is reason to suspect that the visibility of distant lights depends on the volume of the impression, in a greater degree than has, perhaps, been generally imagined.

5. That as the size and intensity of the radiants causing these various impressions to a distant observer, are the same, the volume of the light, and, consequently, *cæteris paribus*, its visibility, are, within certain limits, proportionate to the time during which the object is present to the eye.

Such appear to be the general conclusions which these experiments warrant us in drawing; and the practical results, in so far as lighthouses are concerned, seems sufficient to discourage us from attempting to improve the visibility of fixed lights in the manner proposed by Captain Hall, even supposing the practical difficulties connected with the great centrifugal force generated by the rapid revolution of the lenses to be less than they really are.

Mr. Stevenson adds, in conclusion, that this decrease in the volume of the luminous object caused by the rapid motion of the lights, is an interesting effect, from its apparent connexion with the curious phenomenon of irradiation. When luminous bodies, such as the lights of distant lamps, are seen by night, they appear much larger than they would do by day; and this effect is said to be produced by irradiation. M. Plateau, in his elaborate essay on this subject, after a careful examination of all the theories of irradiation, states it to be his opinion, that the most probable mode of accounting for the various observed phenomena of irradiation is to suppose, that, in the case of a night-view, the excitement caused by light is propagated over the retina beyond the limits of the day-image of the object, owing to the increased stimulus produced by the contrast of light and darkness, and he also lays it down as a law, confirmed by numerous experiments, that irradiation increases with the duration of the observation. It appears, therefore, not unreasonable to conjecture, that the deficiency of volume observed during the rapid revolution of the lenses may have been caused by the light being present to the eye so short a time, that the retina was not stimulated in a degree sufficient to produce the amount of irradiation required for causing a large visual object. When, indeed, the statement of M. Plateau, that irradiation is proportional to the duration of the observation, is taken in connexion with the observed fact, that the volume of the light decreased as the motion of the lenses was accelerated, it seems almost impossible to avoid connecting together the two phenomena as cause and effect.—*Abridged from Jameson's Journal*, No. 61.

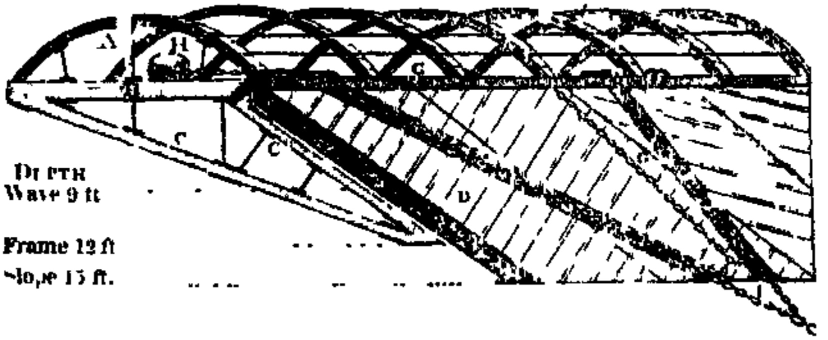
EMBANKMENT OF THE NILE.

Dr. Labat has transmitted from Egypt the following details of the plan adopted by Mehemet Ali for carrying into execution the Improvement of the Nile, first conceived by the Emperor Napoleon.

The first great work is to be the establishment of a bridge of eighty-three arches, running from the point of the Delta to each of the opposite banks of both branches, similar to the Pont-Neuf, at Paris. On each side of the spur, a sluice is to be formed for the purpose of navigation. All the eighty-three arches are to be also furnished with flood-gates of iron or wood, to be opened or shut, according to the wants of traffic and navigation. A tunnel is to be cut through the spur of the Delta, forming a communication between the two branches of the river. Canals are also to be cut from each branches running to the east and the west, with various minor channels, with sluices for the commerce and irrigation of the country. Above the bridge, the Nile is to be embanked on each side, so as to keep the water always within a certain level, and all these embankments will be faced with masonry. Concrete will be used for all the submarine works, and the rest will be done with square stone, rubble, and bricks. These materials are found in abundance in Egypt, and even in the immediate neighbourhood of the works. Artificial pozzolane is in general use, being obtainable in all parts of the country from pulverized bricks. This matter, which is analogous to that produced by volcanos, being mixed with lime and rubble, form what is called béton or concrete. Before the discovery of this pozzolane, which costs 5f. the cubic-metre on the spot, it was brought from Italy, at the expense of 45f. or 50f. the cubic-metre. The cost of the bridge has been estimated at 7,000,000f., and cannot exceed 10,000,000f. When once the materials are collected, it will require no more than three years for 5,000 men to complete this colossal undertaking, which will vie in grandeur with the celebrated monuments of ancient Egypt. According to a calculation recently made by a Parisian engineer, it appears that the present irrigation of Egypt, though very limited in comparison to what will hereafter be accomplished, costs the labour of 200,000 oxen and 100,000 men.

REID'S FLOATING BREAKWATER.

FLOATING Breakwaters are, at present, occupying much of the public attention; which has led the inventor of the present one to communicate his design to the *Civil Engineer and Architect's Journal*, No. 36.



A is an arched frame of timber in thicknesses, 6 feet high in the centre, B, frame of timber bolted together, 2 feet square, and 20 feet long on the chord line; C, sloping frame of timber, 1 foot square, secured with iron straps bolts, and stays, and protected at the point by iron shoes; D, inclined plane or shutter, 24 feet 6 inches long, laid to an angle of 35°, with planking diagonally bolted to a framework of timber, at 3 or 4 inches between the planks; E, iron cable; F, bridle, and G, chain for lifting shutter, H, bit or head, to which the cables are secured.

If the depth of the wave be 9 feet below the chord bar of the arch, there will be 6 feet (perpendicular) of the shutter below that; the inclined plane will underrun the wave, and the arched framework above will offer a gentle resistance for the wave to fall upon, and distribute itself harmless. There will be no strain upon the hinges, the cables being secured to bits in the centre of the raft. When the sea strikes the front of the inclined plane, the framework will yield, and the hinges will prevent that sudden check which the cable tightening would give to the work. Were they not there, the frame would almost instantly resume its place: the buoyancy of the shutters takes all the weight from the hinges. The principal use of the hinges to the shutters is for the more easy recovery of the moorings. A small chain attached to the shutters will enable them to be weighed at pleasure, when at the surface, they are easily hung to lighters The iron plates on the shutters under the moorings will prevent the wood being chafed away by the friction Each shutter is proposed to be 30 feet long; the raft can be increased to any height, though 60 feet broad would be sufficient for the heaviest sea. Unlike a beach, there would be no back-run of water it is considered that so broad a raft would, from its own hold of water, render the whole front stationary, and that 20 feet perpendicular would be deep enough for any weather And the inventor has based this conclusion upon "seeing plans of others, and hearing objections urged"

Captain Sleigh has also proposed a Floating Breakwater, and published a pamphlet on the subject, illustrated with diagrams In a discussion upon this invention, by the British Association, Mr Fairbairn observed that he considered the plan of presenting as it were an artificial beach to break the force of the waves, the best he had yet seen, but the question was not whether this artificial beach would be serviceable if fixed, but how to keep it fixed Mr Bucke said, that a Floating Breakwater was an impossibility nothing could break the water if it floated, it should be fixed, to effect that purpose A momentary amelioration of the force of the wave was not worth the expense of the breakwater

FORMS OF BREAKWATERS

ON April 19, in a discussion by the Institution of Civil Engineers upon a paper by Colonel Jones, "On the Forms of Breakwaters," it was contended, that the action of the shingle upon certain beaches, which had been treated of at great length by Mr Palmer, in a paper sent to the Royal Society, demonstrated the necessity of adopting a slope for works destined to support the action of the sea, and that as the angle of the shingle varied under different circumstances, which stone-work could not do, it was necessary to adopt a slope which should provide against the most violent efforts of the sea

Professor Vignoles has also called the attention of the British Association to the works now going on at Algiers, in the formation of Breakwaters by the use of concrete, under the direction of M Poirel, where, he said, a shelter had already been made for fifteen sail of the line, at an expense, even under all the difficulties presented by the circumstances of the country, of about 20s per cubic yard, and he had no doubt that in this country, in any situation where a good hydraulic lime could readily be procured, the expense would not exceed 10s per cubic yard Some very extensive works of the same kind have also been executed at Marseilles

FLOATING BRICKS

SOME Bricks have been made of a clay from the soil of Berlin, which, on account of the fossil infusoria contained in it, will float in water —(See the *Chemical Section* of the present work)

STEAM PILE-DRIVER.

MR. J. MILNE, of Montrose, has introduced into the Harbour-works there a self-acting Machine for Driving Piles. The moving power is taken from a cylinder connected with the engine erected for pumping out the water from the dock, which does its work in a most admirable manner. There are two other pile-driving machines, wrought by manual labour, in operation alongside of it, requiring nine men to each; and this self-acting machine, attended by one man, gives seven strokes for every one that the others give; so that it does the work of sixty-three men. It can be extended in the same proportion to any power.—*Montrose Review.*

SELF-ACTING WEIR.

MR. BATEMAN has explained to the British Association his Self-acting Weir. The objects were, to act as a self-acting waste-weir and scouring-sluice, in order to prevent the inconveniences now experienced from fixed weirs, in stopping the channels of navigable rivers, and flooding the adjacent country. By his ingenious invention, adjusted to the action of high and low water, by means of moveable gates and other contrivances, he has provided against these "accidents by flood," &c., and especially provided for scouring the bed of the river by an opening in the lowest part of the weir. In a conversation which ensued, it was suggested that it would be essentially necessary in such a weir to protect it from being infringed on or choked by trees, &c., brought down by the stream; and the leading engineers present, complimenting the inventor, and mentioning something of the same kind in the side-sluices of the great canal at Amsterdam, expressed a desire to see his design in practical use.—*Literary Gazette,* No. 1328.

FLUSHING APPARATUS.

ON April 19, was read to the Institution of Civil Engineers, a paper describing a Flushing Apparatus, used for cleansing the Sewers in the Holborn and Finsbury Divisions, with remarks upon the causes of Accumulations in Sewers, by Mr. Roe. It appeared, that in these two districts there are upwards of eighty miles of sewers, in a large proportion of which, from the variety of levels, the general want of fall, and other causes, large deposits take place, causing manifold inconveniences, as well as generating bad effluvia, &c. The means formerly adopted for clearing away these deposits, was to open the sewer, raise the mass of silt into the street, and cart it away. The annoyance was so severely felt, that experiments were instituted for the purpose of endeavouring to use a head of water, for forcing forward the accumulations, and cleansing the sewer. After many trials, the apparatus, of which models and drawings were exhibited, was invented by Mr. Roe, surveyor of sewers for the districts in question. The apparatus consists of an iron frame, set in the sewers with a hinged door half its height, which fits with a water-tight joint; it is opened and closed by means of a jointed rod, which is worked from the level of the street. A head of water is allowed to collect against the closed door, and, when sufficiently heavy, the door is suddenly opened, and the whole mass moves forward, carrying before it all accumulations, until it issues at the outfall. This operation is repeated with a head of water of [illegible] feet, at intervals of half a mile, and the success is stated to be perfect. Numerous modifications of the system were described, and many improvements, which have sprung out of the first invention.

NEW DOCKS AT SOUTHAMPTON

On August 27, the New Tidal Dock at Southampton was opened for the first time. This tidal dock is the largest in England, the inside, from wall to wall, covering an area of sixteen acres; there will always be 18 feet water at low water spring tides. The opening is 150 feet in width, thus admitting vessels of almost any tonnage. This dock was commenced in October, 1839, and has cost about £110,000. There is another dock in progress, called the inner or wet dock, which covers an extent of 14 acres.

BRIDGE-BUILDING

The French papers mention that M. Fèvre, the Inspector General of Ponts et Chaussées, has made his report of an experiment on a system of Bridge-building, the invention of Mr. Neville, an English engineer. The experiment was made on a small bridge, six metres sixty centimetres in length, and one in width, in the factory of Messrs. Bouttevillain and Brunet. Each end of this bridge, which weighs 700 kilogrammes, was placed on a beam, without being secured by masonry, or any other means. A weight of 6,000 kilogrammes, which was about 1,000 kilogrammes per superficial metre, having been placed up on the bridge, it only yielded 9 millimetres at the ends; and a kind of cart heavily laden was drawn over it without producing the slightest effect upon its solidity. These trials having been made, M. Fèvre, with the concurrence of several distinguished men of science who were present, pronounced them to be conclusive of the superiority of Mr. Neville's system.—*Athenæum*, No. 713.

SUSPENSION BRIDGE OVER THE DANUBE

On August 24, was laid the foundation stone of the Suspension Bridge now in course of construction across the Danube, to unite the cities of Pesth and Buda. Of this gigantic work two coffer-dams, unequalled in cubical dimensions by any yet constructed, have been completed water-tight, being those on the Pesth side, where the above stone, a block of granite, about 90 cubic feet in size, was laid by the Archduke Charles, attended by Mr. W. Tierney Clark, the engineer of the work.*

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* Captain Basil Hall observes: "It is strange that the plan of making bridges of iron wire, so successfully adopted in Switzerland, France, and elsewhere abroad, should not yet have found favour enough in England to be fairly tried on the large scale. The noble bridge of Freyburg, in Switzerland, is 301 feet wider than the Menai Bridge; and although it consists of one span, it is, at least, equally strong, and cost only a fifth part of the money. The wire-bride of Freyburg is 870 English feet span; that of Menai 569. The Menai Bridge cost £120,000; that of Freyburg, £25,000."—*Patchwork.*

DREDGE'S SUSPENSION BRIDGES

Eight bridges on Mr Dredge's plan of suspension,* have been now erected, and several others have been ordered, or are now in the course of construction The Victoria Bridge, across the Avon, at Bath, of 150 feet span, was constructed in 1836, since then, five have been built for the Government, in Regent's-park, London, one across the Leven, Lochlomond, in Scotland, for Sir James Colquhoun, Bart, which is not less than 294 feet in length, and 20 feet wide, and one for G S Harcourt, Esq, at Wraysbury, near Windsor, (close to the famous Runnymend,) which is of 100 feet span, and 17 feet wide The last took only three weeks in construction, after the foundation stone was laid, and the cost has not been half what the mere centring for a common stone bridge would have cost —*Mechanics' Magazine*, No 1001.

NOVEL DIVING-BELL EXPERIMENTS

Dr Payerne a native of France, has succeeded in producing pure air, fit for the respiration of man and for supporting flame, without communication with the external air The Doctor made his experimental descents at the Polytechnic Institution, when the air-tube having been taken from the diving bell, and a plug inserted in its place, Dr Payerne descended in it at a few minutes after ten o'clock, and remained under water for the space of three hours and a half He took with him wrapped in a handkerchief, a parcel about eight inches square, first covering the window of the diving bell with paper, in order that the public might not be able to see what he did when under water He gave signals by agreement, every ten minutes by removing the paper from one of the windows and waving his hand, in order to show that all was right, had this not been done regularly, the diving-bell would have been raised Of the equal efficiency of this invention in practice great doubts were entertained by Major-General Pasley, and Dr Payerne subsequently descended at Spithead on September 2d, having first filled four iron cylinders with condensed air, which was forced into them by a small air-pump until the gauge proved that the pressure was equal to nine or ten atmospheres These cylinders were four feet long, and about a foot in diameter, with hemispherical ends, being the same that had been used for containing condensed gas during the period that the Portable Gas Company was in operation Each of these cylinders held about three cubic feet of compressed air, and the whole were lashed to the bottom of a wrought iron diving bell in which Dr Payerne took his seat, accompanied by Major General Pasley The contents of three cylinders were now let into the bell, by turning the cocks at the end of each, so that when they descended to the depth of twelve and a half fathoms, or seventy five feet, the water only stood about six inches high in the bottom of the bell, but they were hauled up by mistake of a signal before they had quite reached the bottom Next day, the experiments were repeated, and the Doctor and the Major descended a second time, and, as the men above had strict orders not to stop lowering until the diving-bell reached the bottom, and not to haul it up again, unless the signal line was pulled three or four times, Dr. Payerne had the satisfaction of getting a small piece of wood from the wreck of the Royal George, after which he made the signal to ascend. Another experiment, of still greater interest, was made at the suggestion of Lieut. Hutchinson, who went down without any air cylinders, accompanied by Mr. Hardman, having the end of one of the diver's air-pipes with them, through this, air was forced into the bottom of the diving-bell by one of the small pumps which usually supplies air for a helmet-diver. By means of this pump, the water was expelled from the lower part of the diving-bell, and replaced by condensed air, which enabled them to descend to the very bottom, there being no cylinders to prevent the bell from taking the ground, as in the former experiment, and Mr. Hardman also brought up some small relics from the wreck.

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* Described in the "Year Book of Facts," 1841, p 35

The result of these experiments is, that both Major-General Pasley and Lieut. Hutchinson considered the air they breathed in the bell to be pefectly good: the whole apparatus for purifying it was contained in a case not larger than a common portable writing-desk, which gives no trouble but that of turning a small winch or handle occasionally, and as, besides water, two very cheap and simple ingredients only are used, the manipulation requires no science on the part of the person in charge: and when the diving-bell is once filled with compressed air, either by letting it escape from vessels previously filled with it, or by four men pumping for less than half an hour, no more pumping is necessary, as the air in the bell never requires to be changed. In the common mode of working the diving-bell, on the contrary, a powerful pump, manned by six or eight men, would be required at Spithead, which must be kept constantly at work the whole time that men are down in the diving bell, and this incessant pumping is so laborious, that from twelve to sixteen men, working in two reliefs, would be necessary for the purpose of expelling the water.

It is to be remarked that the French have for many years speculated upon the practicability of submarine boats, as we know by having seen French pamphlets on the subject. One of Dr. Payerne's countrymen, the Marquis D'Aubusson, has been engaged in this object for several years, but, after planning all the other arrangements to his own satisfaction, he could not satisfy himself as to the means of supplying the men in his submarine boat with air. Dr. Payerne states that a conversation on the subject of the Marquis D'Aubusson's plan with a person who mentioned it to him, first induced him to consider whether it might not be practicable to produce pure air under water without any communication with the atmosphere—that this led to the invention which he first tried at the Polytechnic Institution, and of which, as applied to the diving-bell, he has proved the safety and superior efficiency at Spithead.—*Times*, *Sept.* 6. *abd.*

The opinions of these results appear to be various. The Editor of the *Mechanics' Magazine*, No. 981, considers that, "supposing the conjectures" as to the contents and use of the box and cylinders to be correct, Dr. Payerne has discovered "the practical means of living under water." The Editor of the *Civil Engineer and Architect's Journal*, on the other hand, believes Dr. Payerne only to have accomplished, with the box, that which he might have effected without it; and this by *the atmospheric air alone contained in the bell*, without any additional supply; adding that although he considers Dr. Payerne's experiments to have entirely failed in showing that "he possesses any peculiar art in transmuting water into air, they have been productive of advantages by proving that operations under water may be conducted with a much smaller supply of air than has hitherto been considered necessary." The Editor adds, that the last experiment, viz., that by Lieut. Hutchinson and Mr. Hardiman, is "the plan first adopted by Smeaton, and since generally employed; the only variation being that the pipe was smaller, and was taken down into the bell instead of being inserted in the top." (See *Civil Engineer and Architect's Journal*, Nos. 61, 62, 63.)

The Editor of the *Mechanics' Magazine* observes on the secret: "It is only to take down with you something that will absorb the carbonic acid gas as fast as you generate it, and something else (with a lucifer match or two to heat it,) from which you may set free oxygen enough to keep you alive. Doubtless, these are the main conditions of the experiment—and there are several well known substances which do possess these two requisites. Pure potassa, for example, will absorb nearly half its weight of carbonic acid gas; and chlorate of potass gives out, when heated, 39·15 parts per 100 of oxygen."

DIVING BELLS FOR MEN OF WAR.

COMMANDER H. DOWNES, R.N. recommends that in line-of-battle-ships, and in the larger frigates, one of the tanks for water should be so constructed, as to do, if required, double duty, viz. that of tank and diving bell; such to be stowed at the mouth of the hatchway and the first one to be emptied; and he suggests that instructions in the use of the diving-bell be given to the officers and men. The advantages of having a bell ready at hand and at such a trifling expense as it is presumed this contrivance would incur, will be acknowledged by most naval men, who may recollect positions in which they have been placed, where such an instrument might have proved not only useful, but perhaps even, the saving of the ship. One instance may be adduced wherein a trial has already been made with a ship's tank, and most successfully too, by Capt. Dickinson, R.N., in removing the treasure wrecked in the *Thetis* frigate.—*Times, September* 1.

REMOVAL OF THE WRECK OF THE ROYAL GEORGE, ETC.

THE operations against this wreck have been carried on during the past season with greater activity than in any former year, and in September last, the remains were buried in a shoal of mud only a few feet higher than the adjacent anchorage. A small vessel, sunk about 50 fathoms south of the *Royal George*, has also been entirely removed. This wreck was not attacked until June 1 · it was found to be about 60 feet in length, and the timbers could be traced all round, rising 5 or 6 feet above a small shoal, on which it was partially imbedded, the upper part of the timber being worm-eaten and decayed; and, as only one diver could work upon it at a time, the removal was not completed till August 13. This little vessel proved to be a mooring lighter employed by Mr. Tracy, in 1783, in his unsuccessful attempt to weigh the *Royal George*, and was sunk in that operation. The then master-attendants of Portsmouth dockyard reported to the Navy Board, by letter dated the 20th of April, 1784, that they had tried to weigh this lighter, but failed, and that though it was perfectly practicable to recover her by employing more men and vessels in a second attempt, her value would not even pay for the cordage that would be expended in the operation. She was, therefore, left at the bottom, to be removed, 59 years after she sank, by a corporal of the Royal Sappers and Miners. No part of her is now left, the floor-timbers, kelson, planking, and keel, having successfully been got up, but not without expending about 750lb. of powder in charges placed from time to time by the same intelligent and active diver, of which the largest was 180lb , none of the others exceeded 70lb.

The demolition and removal of the wreck of the *Royal George* has been going on with equal zeal and activity, never fewer than four or five, and six divers, being employed On the 20th of June, 3,065 cubic feet, or 61 loads, of timber had been recovered from the two wrecks, besides 219 pigs of iron ballast, from the *Royal George*, the latter weighing, at 3 cwt. each, 32 tons 17 cwt. Of these, Lance-Corporal Jones, one of the best divers, sent up 19 pigs, or nearly 3 tons, in one day. On the 30th of June, the quantity of timber stacked for sale in the dockyard amounted to 6,804 cubic feet, or 136 tons, from the *Royal George*, and 2,187 cubic feet, or 44½ loads, from Tracy's lighter. An additional quantity of iron ballast, &c , was also recovered The timber recovered from the *Royal George* has chiefly been floor-timber, or rather large fragments of them; but on the 28th of June, were got up 24 feet, and next day 20 feet more of the kelson; and on the 27th of August were sent up two pieces of the keel, measuring together 10 feet 6 inches in length, of 16 by 18 inches scantling, with copper bolts and clamps for the kelson, which were rendered accessible by a charge of 170lb. of powder, fired to clear away a mass of coals.

From this wreck much fewer remains of the unfortunate crew have been brought up than might have been expected, only one perfect skull having been found this season. An 18-pounder iron gun was got up by Private Cleghorn on August 27, being the first recovered this season; but if the accounts furnished by the Ordnance-office at the commencement of these operations are correct, there ought still to remain 20 brass guns at the bottom.

More than 4,000lb. of gunpowder have been fired against the wreck of the *Royal George* this season, chiefly in small explosions, not usually exceeding 70lb.; but whenever charges of about 200lb. were to be fired, red flags were hoisted on the *Success* frigate hulk, as well as on the mooring lighter, some hours before, as a signal.

Every thing is now well arranged; the officers, divers, sappers and miners, riggers and pensioners, employed, all having had the experience of one, and some of two summers, in their respective duties. Great improvements have been made in the management of the voltaic battery; the diving apparatus has also been brought to a superior degree of perfection, for whenever any difficulty or inconvenience was experienced by the divers, it was immediately communicated to and removed by the ingenious maker, Mr. Siebe, of Denmark-street, whose diving-dresses, air-pumps, &c., are now exclusively used in the operations against the wreck of the *Royal George*, having been preferred by the military divers to the other patterns which were in use at first.—(*Abridged from The Times*, *Sept.* 2.) For reports of the previous operations, see *Year-Books*, 1841, p. 31; 1842, p. 46.

NEW MODE OF RAISING SUNK VESSELS.

M. VIAN has described to the Academy of Sciences, at Paris, an apparatus for the above purpose, consisting of a covered but light and air-tight framework, which he calls the Hydrostadt. The process is commenced by allowing the water to run in and fill the Hydrostadt, which, of course, sinks until it reaches the object it is intended to raise. The valves are now closed, and the apparatus fixed by chains, or ropes, to the vessel. A stop-cock, connected with a pipe, is opened, and this pipe communicates with two recipients on a stage or platform erected on a boat, or vessel, near the spot. One of these recipients contains an acid, and the other carbonate of lime, and a communication between them is established, so as to keep up a sufficient supply of carbonic acid gas, which passes through the pipe into the Hydrostadt, and displaces the water. The Hydrostadt, now filled with a light gas, will naturally rise to the surface, if its volume be large enough to drag with it the body to which it is attached.

THE TELEMAQUE TREASURE SHIP.

THE raising of the *Telemaque* Treasure Ship, which was sunk in the Seine, near Quillebœuf, about 50 years ago, has been commenced by a body of English engineers, conducted by Captain Taylor.

It appeared, by minute examinations, by soundings and by divers, that the *Telemaque* was lying on her side on a bed of sand and rock, in about 8 feet water at ebb tide, a drift of mud sloping the height of her deck; but on the other side, half of her bottom above her keel was entirely clear. The parties who have hitherto attempted to raise her proceeded on a plan which has often succeeded in tolerably smooth tidal waters. They passed chains round the vessel at low water, carried the ends of these chains into two large barges moored at the head and stern of the *Telemaque*, and then expected that, as the tide rose, the barges would raise the sunken brig by the chains But, as the tide in the Seine rushes up in a sudden and lofty wave or bore, the barges were dashed up, and the chains were either disengaged, or, being unequally strained, broke

Captain Taylor has moored a barge near the wreck, and has there established his head-quarters with 30 picked English workmen, who live there night and day, to take advantage of every favourable hour of the tide They commenced operations by driving wooden piles pointed with iron, on which a stage has been erected, so as to form a solid superstructure or bridge resting over the *Telemaque* Iron harpoons, with barbed points, were then driven right through the vessel, and chain-cables were passed round the bow and the stern, and longitudinally from the stem to the stern of the vessel The next process was to fix powerful screw-jacks, and then, by them, slowly and evenly worked, to raise the brig Next were to be attached to it cable chains, worked by powerful capstans on shore, so as to drag the wreck slowly towards the quay in a position where it would be high and dry at low water —*Correspondent of the Times*

PRESERVATION OF LIFE AT SEA

A LETTER has been addressed to Lloyd's, from Mr F Jennings Lieut R N , suggesting the general adoption, in rough weather, of life-lines being led fore and aft, both to windward and leeward, so that the men have something to lay hold of in passing from one end of the vessel to the other In addition to this, he advises that each man be furnished with a belt made Gasket fashion, about a fathom and a half long The utility of this is shown by the wearer, when in an exposed situation, such as on the forecastle, conning, steering, &c , taking two half hitches with it, to either the life-line or any of the standing rigging, &c He observes that such a belt could not interfere with the wearer's duty aloft, as at such times the end might be wound round the body, and tucked in He concludes by impressing the necessity of each captain of merchant-vessels being supplied with a good barometer, as a great deal of wear and tear of spar and canvas might be thereby avoided, and the loss of shipping also prevented

FORM OF SHIPS

MR SCOTT RUSSELL has presented to the British Association, the Report of a Committee on the Form of Ships, the following abstract of which has been derived from the *Athenæum* account It contains upwards of 20,000 observations, the result of careful experiments on the resistance to models of ships of more than a hundred different forms and sizes , and extending from small models of 30 inches long, to vessels of 25 feet, 60 feet, and 200 feet long, and above 1,000 tons burden The smaller experiments have been made in a reservoir in the ground attached to Mr Russell's residence, and the larger ones in the open sea. It is probable that these results, maturely digested, and illustrated by accurate drafts of the forms of the ships subjected to experiment, will be published in such completeness as may be practically serviceable to the naval constructor and mercantile ship-builder Mr Russell has contrived a new apparatus, which is so simple and convenient, that a uniform propelling force is obtained, by which vessels of any magnitude may be drawn by a uniform mechanical force along any given distance The forms of the models employed were not confined to mathematical and arbitrary solids, but were those of such classes of ships as are either actually employed in navigation, or have been proposed for that purpose Among these were some of the highest reputation It was found that there were other circumstances besides the form of the vessel which affected the result, and that the form and dimensions of the channel were as important as those of the vessel in determining it. As an illustration of the value of giving a proper form to ships, altogether independently of proportion or dimension, the following remarkable experiments were adduced — Four vessels, of about 25 feet length, having all the same dimensions of breadth and depth, of the same capacity and weight, and of the same draft of water, were towed together at the same time, under the same circumstances, and at the same velocity Their draft of water differed so much in resistance, that the one had nearly double resistance to another thus, at 7½ miles an hour, the resistances were as follows —

No I form	56 6 lb	resistance
No II	138 5	—
No III	102 7	—
No IV	90 2	—

All of these were good sea boats, and it was one of the most valuable of these results, that No I, the form of least resistance, was found also the best sea boat, the easiest, and the driest

IRON SHIPS.

MR GRANTHAM has read to the British Association a paper "On Iron as a Material for Shipbuilding" The form of least resistance is not safe in timber, though it is in iron, yet shipowners, missing the heavy timbers and thick planks, distrust the thin plate and light ribs Mr. Grantham considers iron vessels superior in strength and durability, facility of uniting, comparative stowage, comfort and convenience, amount of expense and from the source from which the materials are derived, he believes that, from all these advantages, wooden boats will soon be disused As for the advantage in the outlay of money, the *Hindostan* has cost £72,000, of which about £12,000 was for labour and £48,000 for wood, and much of this was expended in the East Indies, but an iron ship of £72,000 value would cost £67,000 in labour, all expended in this country, and the remaining £5,000 would also be paid here for the raw material. Mr Grantham then adverted to a new rolled keel, patented by Mr. Boydell He also stated, to show the capability of iron boats to resist injury, that the *Acadia* had run down a small iron ferry boat, completely submerging it and tearing away all the wood-work, &c.; but the vessel rose like a cork as soon as the *Acadia* had passed over, the iron work being uninjured, and three men who were in the cabin were saved.—*Athenæum*, *No.* 768.

SHIP-REPAIRING PLATFORM.

ON April 26, Mr. R. Mallet described to the Institution of Civil Engineers, an apparatus for Raising Ships out of water for Repair, proposed to replace the Graving-Dock or Patent Slip. Mr Mallet reviewed the principal methods hitherto in use,—such as stranding by bilge-ways, careening or heeling over, lifting by the camel, the graving-dock, the floating-dock or caisson, the screw and the hydraulic docks, (both American inventions,) and Morton's patent slip, together with the localities for which each of these inventions is most applicable, and the objections to them. The general principle of Mr. Mallet's invention is the diffusion of the load or strain over the greatest possible number of fixed points, avoiding casual and unequal strains, that there should be uniform motion, with a power proportioned to the resistance. In providing for this, the toggle-joint is used throughout. The machine consists of a platform, supported upon a series of frames with joints at each end, attached at the lower extremities to fixed points in the foundation, and at the upper ends to the under side of the platform, which is traversed by a series of beams, to the ends of which are fastened rods connected with rollers, working in grooves along a suspended railway on the cantilevers of two jetties, which are built to form the sides of the apparatus. A chain connected with all these rollers traverses in each suspended railway groove, and the power of a steam engine and wheel-work, being applied after the vessel is floated on the platform and made fast, the frames raise the platform and vessel together gradually out of the water, permitting free access all round the ship, and when the repairs are completed, the whole is again lowered into the water. It is contended that many practical advantages would arise from this system—that the ship would not be strained—that time would be gained, and that it is superior to the ordinary methods now practised.

HOLCROFT'S PATENT PORTABLE SAFETY-BOAT, OR PONTOON.

THIS Boat is of French origin, but has been patented in this country as well as in France. It is constructed upon the principle of a skeleton frame, easily put together, and as easily disconnected and folded in a small compass. The skeleton is constructed so as to fold easily and commodiously into one-sixth of the space which it occupies when it is expanded, and put to its proper use as a boat, and it is covered over with two folds of canvas of the best and strongest quality, which, after having been previously prepared with dissolved caoutchouc, are glued one to the other, on the innerside of each, by a solution of the same material, so as to form an impenetrable and durable covering, wholly impervious to water, and more capable of resisting a sudden shock from breakers or sunken rocks than either oak or the strongest deal planks would be. To provide for the permanent and unconquerable buoyancy of the safety-boat, it is provided with air-cells, or cases partitioned off, and each rendered independent of each other; so that in case of an accidental fissure being made in any one of these cells, the remainder, being uninjured, enable the boat to preserve its buoyancy.

The strength of the canvas can be increased at pleasure, according to the size of the boat, or the mode in which it is to be employed, so as to give this material a degree of strength equal to that of sheet iron; while its pliability adds greatly to the safety of the boat, by enabling it to sustain the shock of an accidental encounter with a rock or other hard body, by which an ordinary boat would be staved and swamped. The interior of the boat may, moreover, be strengthened to any degree required by the employment of thin sheets of iron or planks of wood, disposed so as to form a commodious bulwark and footing along the sides and bottom.

For further details of this important invention, see an illustrated description communicated to the *Mechanics' Magazine*, No. 977.

SINGULAR NAVAL OPERATION.

THE *Penelope* frigate, of 46 guns, has been taken into dock, at Chatham, and the process of removing one-half of the ship from the other performed. The sight was novel and astonishing. Three ropes were fastened to the gunwale of the ship from three capstans, which were fixed in the ground facing the dock, and which were worked up by windlasses by nearly 200 convicts. The fore part of the vessel was observed easily to glide up the dock. The fore part of the ship having been brought up to the mark allotted, left a space between the two parts of the ship exactly 62 feet, which will lengthen her to about 190 feet. She is to have in her two engines of 650-horse power, and to have engine room for 600 tons of fuel; complete stowage under hatches for 1000 troops, with four months' stores and provisions, exclusive of a crew of about 450 men; and is to be armed with 20 guns of the heaviest calibre, besides carronades. The *Penelope*, when complete, will be the finest war steamer in the service.—*Hampshire Telegraph.*

COPPER SHEATHING OF SHIPS.

ON March 1, in a discussion upon Copper Sheathing, by the Institution of Civil Engineers, many curious facts were elicited. Thus, the early specimens of copper sheets were found to have been more durable than those of recent manufacture—the former contained an alloy of 1-300 part of zinc. Muntz's patent metal was alloyed with about the same proportion of zinc, which accounted for the good reputation which it enjoyed for durability. Prof. Faraday, Mr. Phillips, and Mr. Taylor, have been consulted by the Admiralty upon the difference of durability of metal sheathing: they recommend assaying, but have not been able to detect any difference in the chemical constitution of the numerous specimens submitted to them. Several curious circumstances relative to the uncertainty of the quality of copper produced by the same process of manufacture, were mentioned and commented upon.

FOUL AIR IN MINES.

Mr. Hardiman has experimented at the Royal Polberon Consols Mine, in St. Agnes, with his newly-invented method of Purifying the Air. The experiment was made at a depth of about 700 feet below the surface; and where the air was previously so vitiated that no person could approach the place, (a rise 9 fathoms above the level,) a powerful machine, attached to the engine-rods, was put to work some time previously, which barely furnished air for three men with candles to exist. The new method of purifying air was brought into action after this air-machine had been thrown out of use; and although there were, at that time, no fewer than 15 men with candles in the rise, the air, in ten minutes, was so renovated, that all breathed with comparative ease; the improvement was even visible, inasmuch that where three candles were until then with difficulty made to burn, ten or more now burned freely. As a further test, two holes were blasted, and under the old method no man could approach the top of the rise until half an hour after the explosion, and in some cases longer; whereas, the machine so quickly dissipated the smoke, that in four minutes the men resumed their work, breathing air comparatively pure, and refreshed with the additional advantage of being as cool as if they were at the surface; although there were, as before stated, 15 men in the rise.—*Times, Oct.* 18.

MANUFACTURE OF IRON.

M. Ebethelm has stated to the Academy of Sciences, at Paris, that he is satisfied, from a series of experiments, that the present mode of constructing furnaces is as near to perfection as possible; but that nearly two-thirds of the combustibles employed pass off in gas, and that there would be great economy and advantage in a contrivance for preserving this gas, and making it useful in the process of smelting. The paper, however, leaves the question of the precise and best mode of obtaining this result still doubtful.

INTRODUCTION OF THE HOT BLAST IN PLYMOUTH DOCK-YARD.

Great improvements have been made in the north smithy of this dockyard, in superseding the blowing machines by the introduction of the fire blast, worked by steam power. All the old bellows are removed from the fires or forges; air pipes, conveying the blast produced by the fans, are fitted in their places. The building, in which are the fans and the steam-engine that drives them, is erected without, adjoining the smithy. The air drains or tunnels, into which the air produced by the motion of the fans is forced, are dug out of the solid rock, and are carried along through the shop, under the surface of the floor at the backs of the forges, where openings are cut, and pipes introduced to convey the air to the fire. By the continual and steady blasts of the fan, the heats are much more quickly produced than by the blast of the bellows; consequently, the heats in the course of the day are more numerous, and the metal in heating and forging does not diminish so much.

THE HOT-BLAST PATENT.

THIS patent expired on the 11th of September for England, and on the 1st of October for Scotland. Besides being of great national benefit, it has realised a sum of not less than £150,000 to the patentee, and has placed John Beaumont Neilson high in the ranks of benefactors of, not his country alone, but of mankind, iron being the most useful of the metals, and its cheap production of immense importance in arts and manufactures, on which the conveniences and comforts of life depend.—*Times, Nov.* 25.

CAST-IRON BUILDINGS.

BUILDINGS of cast-iron are daily increasing at a prodigious rate in England, and it appears that houses are about to be constructed of this material As the walls will be hollow, it will be easy to warm the buildings by a single stove placed in the kitchen. A three-story house, containing ten or twelve rooms, will not cost more than £1,000, regard being had to the manner in which it may be ornamented Houses of this description may be taken to pieces, and transported from one place to another, at an expense of not more than £25. It is said that a large number of cast-iron houses are about to be manufactured in Belgium and England, for the citizens of Hamburgh, whose habitations have been burnt.—*Mining Journal*

PRECIPITATION OF METALS.

ON Aug 8, M. Arago gave to the Academy of Sciences, at Paris, an analysis of a paper by M de Ruolz, on the means of fixing one metal upon another, by the galvanic process. M. de Ruolz has covered several specimens with a precipitate of copper and tin in the proportions which constitute bronze, and has altogether established the practical use of his discovery A precipitated coating must always be more regular and uniform than one laid on by the hand; it can be made to any degree of thickness, and cannot be detached from the material to which it is applied. Iron roofs, for instance, both as to frame-work and sheet-iron, may be coated so as to resist the action of the atmosphere, and this without any great addition to the cost; for the coating may be thin, and the iron-work itself, not being exposed to atmospheric action, may be made much lighter. For domestic purposes, the galvanic process, as regards a leaden envelope, may be advantageously employed in various ways; and M de Ruolz suggests its employment for iron shot, which undergoes great deterioration from exposure to the atmosphere.—*Translated in the Civil Engineer and Architect's Journal*, No. 61.

METAL FORGING AND CUTTING-MACHINE.

AMONG the best specimens of mechanism exhibited at the last meeting of the British Association, was a Machine for the Working or Forging of Iron, Steel, &c., which, (says *The Leeds Mercury*,) "is quite portable, occupying only a space of three feet by four feet, and cannot be deemed other than one as purely original in principle, as well as practical in its application; as much so, perhaps, as was the splendid invention of the fluted roller of Arkwright, by which the art and perfection of drawing the fibrous substances became known; or that still more splendid discovery of Watt, the condensing of steam in a separate vessel, by which the power of the steam-engine of that day may be said to have been doubled. This new machine may be worked by steam or water power, and when moved by the former, as was the case at the exhibition, made 650 blows or impressions per minute; but from their very quick succession, and the work being effected by an excentric pressing down, not striking the hammer or swage, not the least noise was heard. There are five or six sets of what may be called anvils and swages in the machine, each varying in size. The speed and correctness with which the machine completes its work, is astonishing: for instance, when it was put into motion for the purpose of producing what is known as a roller, with a coupling square upon it, (and which had to be afterwards turned and fluted,) the thing was accomplished in fifty seconds! of course, at one heat. Again, the coupling square was produced direct from the machine, so mathematically correct, that no labour can make it more so! The machine will perform the labour of three men and their assistants or strikers, and not only so, but complete its work in a vastly superior manner to that executed by manual labour. For engineers, machine-makers, smiths in general, file-makers, bolt and screw makers, or for any description of work parallel or taper, it is most specially adapted; and for what is technically known as reducing, it cannot possibly have a successful competitor: in proof of which it may be stated, that a piece of round iron 1¼ inch in diameter, was reduced to a square of ⅜ in., 2 ft. 5 in. long, at one heat. The merit of this invention belongs, it is said, to a gentleman at Bolton, of the name of Ryder."

SILVER MINES OF ALMADEN, IN SPAIN.

THESE mines have now attained a depth of about 300 *varas*, (nearly 800 feet English), in the seventh or deepest level of the works; and here the ore presents no apparent alteration in quality, or diminution in breadth, of the immense veins in which it is contained. Notwithstanding all difficulties, political, pecuniary, sanitary, mechanical, chemical, and incendiary, (for the mines have been on fire for thirty months together), their produce has been steadily increasing; and although it only averaged 2,500 quintals in the years intervening between 1646 and 1700, it has now risen to 22,000. It was calculated in 1839, when the produce had only attained to 20,500 quintals, that during the 193 years these mines had been conducted on account of the Spanish Government, there had been £55,000,000 sterling worth of silver, coined and uncoined, brought into circulation and into the markets of Europe; counting not only that produced by the process of amalgamation in South America, but that also obtained in Germany by the instrumentality of the mercury supplied from Almaden to the Emperor of Austria. The value of the mercury obtained in 1841, from Almaden, amounted nearly to 25,000,000 reals, delivered to the contractors at the price of 54¾ dollars per quintal, but of this sum something more than one-fourth is returned to these mines to pay the costs of production; so that not much more than 18,000 000 reals, (about £180,000) are available in the shape of revenue to the Spanish Government. The cost is, certainly, much greater than it would be if improved machinery were employed. The labour of unwatering the mine is in particular severe and expensive. A grand reservoir has been formed in the rock in the fifth level, and into this the water of the lower levels is elevated by hand-pumps, at an expense of manual labour of 400,000 reals per annum, although the elevation of this general receptacle above the greatest depth is only 110 *varas*. It is then pumped to the surface by a single-stroke steam-engine, the annual cost of which performance is reckoned at 60,000 reals (£600 sterling). This engine is constructed in imitation of Watt's first engine, with various subsequent additions, which are the very reverse of improvements, and which, by some miracle, found its way to Almaden in the year 1799, having been, probably, rejected thirty years before in England. It is an immense lumbering counterpoise affair, with a long cooling pipe between the boiler and the cylinder, and no valve between, so that the principle of expansion cannot be applied. The condenser sends forth the water nearly boiling hot, which is no wonder, seeing that its valve has no governor and no connection with the moving machinery. In consequence, the boiler takes exactly double the fuel requisite to raise the quantity of water from the mine that it ought to do, and the engine, calculated to be of forty-two horse power, only does the work of twenty and a half. Besides these motive powers, steam and manual, there is an establishment of from thirty-five to forty excellent mules, which are kept constantly at work, eight at once, in drawing up the ore by a very rude wheel capstan, the friction of which is so great that the animals can only work three hours in the twenty-four. There is no water-power available to move machinery in these mines, but there has been very little care bestowed to render any of the mechanical powers available for the abridgment of labour. Even the ore, which is brought up from the deep sinkings by mules at the rate of 3,500 arrobas (25 lb. each) per day of twelve hours, is all drawn to the furnaces by oxen in rude carros, without the slightest aid from a railway.—*Abridged from the Times, Nov.* 11.

COMPARATIVE EVAPORATIVE POWER OF COAL AND OF COKE.

Dr Fyfe, in a paper read before the Royal Scottish Society of Arts, March 28, states, as the results of a series of experiments, "that the practical Evaporative Power of Coke is, by no means, so great as that of the Coal from which it is obtained, for, had it been so, a much greater amount of evaporation ought to have been procured. It has been stated that 1 lb. of coal evaporated in the furnace and boiler used 5·66 lb. of water from 32. Now, this coal yielded 52·5 per cent. of coke; 1 lb. of the coke got from the same coal evaporated 7·33; consequently, ·525 would have given only 3·84."

Dr. Fyfe further considers that the practical evaporative power of bituminous coal is in proportion to the fixed carbon; 1 lb. of carbon will evaporate 12·3 of water. Now, the fixed carbon in the coal, used in the trials just stated, was 50 per cent.; the quantity of water evaporated by the combustion was 5·66; it ought, from the proportion of fixed carbon, to have been 6·16; the deficiency is only 0·5—thus making a very near approximation.—*See Jameson's Journal,* No. 65.

VENTILATION OF HOUSES.

Mr. A. LIDDELL, of Glasgow, has read to the British Association, a paper on the Ventilation of Houses, which has been adopted with perfect success in that city. This mode of ventilation, which consists in drawing off the foul air from each room by a pipe leading to the chimney of a steam-engine, has been attended with the most beneficial results as regards the health of the inmates, and particularly by a great diminution in the number of fever cases. The plan has also been tried in the Glasgow Fever Hospital, in which the beds for fever patients, &c., were fitted up with the tubes for carrying away noxious effluvia. A similar plan for the ventilation of ships and steamers has been introduced by Dr. Reid, by leading tubes from the berths into a stove on deck, or, in steamers, into the chimney. Mr. Liddell stated that the expense for a house of 60,000 cubic feet was only 40 lb. of coal in twenty-four hours. Sir John Robison observed, that it was highly satisfactory to find sound principles in regard to ventilation making their way amongst the people of this country; but it was at the same time to be regretted that ineffective plans should be resorted to, when the very best plans had been many years before the public. The mode of ventilating the Derby Infirmary, devised by Mr. Strutt, and published by Mr. Silvester more than 20 years ago, had exhausted the subject of ventilation.—*Literary Gazette,* No. 1328; *Athenæum,* No. 766.

HEAT OF FLUES.

ON March 16, was explained to the Society of Arts, Mr. E. Solly, jun.'s Mode of Regulating the Heat of Flues. He called attention to the number of accidents that constantly occur from over-heated flues, and the great importance of devising some means for preventing their recurrence in future. He stated, that these accidents were mainly owing to the flues being carried close to, and in some instances through woodwork, under the idea that they would never get heated beyond a certain point. Experience having shown the fallacy of this supposition, Mr. Solly proposed to avail himself of fusible metal. The plan he had adopted was, to bring round, and in contact with the flue, a strip of the metal, and to attach to it the spring of an alarum-bell, so as to go off on the melting of the metal. The degree of heat at which the bell should ring, to be regulated by the composition of the metal, from 200° Fahr. to any limit that might be thought desirable; and thus a succession of warnings might be given, should the heat of the flue go on increasing. Another useful application of fusible metal to stoves, and which, as well as the flue alarum, was illustrated by working models, consisted in passing a strip of the metal over the projecting handle of a stove-door; and by a connecting wire, keeping the ash-pit door partially open, so as to allow a large draught for a short time after putting on fresh fuel. The stove may thus be left in perfect safety, for as the fire burns up, the metal gives way, the ash-pit door closes, and leaves the future admission of air to the ordinary valve. The expense is very trifling, and the plan so simple as to be in the power of any one to put in practice.

WARMING AND VENTILATION OF THE REFORM CLUB-HOUSE.

THIS vast structure is warmed and ventilated upon the condensing plan, as executed by the engineers, Messrs. Easton and Amos. The apparatus consists of a large fan, revolving rapidly in a cylindrical case, and capable of throwing 11,000 cubic feet of air per minute, into a spacious subterranean tunnel under the basement story. The fan is driven by an elegant steam-engine, working on the expansive principle, of five-horse power. It is placed in a vault, under the flag pavement, in front of the building, and as it moves very smoothly, and burns merely cinders from the house-fires, along with some anthracite, it occasions no nuisance of any kind. The steam of condensation of the engine supplies three cast iron chests with the requisite heat for warming the whole of the building. Each of these chests is a cube of three feet externally, and is distributed internally into seven parallel cast-iron cases, (somewhat like empty portfolios,) each about three inches wide, which are separated by parallel alternate spaces of the same width, for the passing of the air transversely, as it is impelled by the fan. This arrangement is most judicious, economizing fuel to the utmost degree, because the steam of condensation, which, in a Watt's engine, would be absorbed and carried off by the air-pump, is here turned to a good account, in warming the air of ventilation during the winter months. Two hundred weight of fuel suffice for working this steam-engine during twelve hours. It pumps water for household purposes, raises the coals to the several apartments on the upper floors, and drives the fan ventilator. The air, in flowing rapidly through the series of cells placed alternately between the steam cases, cannot be scorched, as it is infallibly in air-stoves, but it is heated only to the genial temperature of from 75° to 85° Fahr., and it thence enters a common chamber of brickwork in the basement story, from which it is let off into a series of distinct flues, governed by dialled valves or registers, whereby it is conducted, in regulated quantities, to the several apartments of the building. Dr. Ure, (who has reported on this apparatus,) considers that it would not be easy to devise a better plan for the purpose of warming and ventilating a large house, and he is only sorry that the plan projected by the engineer has been injudiciously counteracted in two particulars

First, the external air, which supplies the fan, is made to traverse a great heap of coke before it can enter the apparatus whereby it suffers such friction as materially to obstruct the ventilation of the house The following experiments made by Dr Ure on this point, will place the evil in a proper light Having filled up Dr Wollaston's differential barometer, as an anemometer, with oil of specific gravity 0 900 in one leg of its syphon, and water of 1 000 in the other, covered with the said oil in the two cisterns at top, Dr Ure found the stream of air produced by the fan, in a certain part of the flue, to have a velocity only as the number 8, while the air was drawn through the coke, but had a velocity in the same place, as the number 11, whenever the air was freely admitted to the fan by opening a side-door Thus three-elevenths, both of the ventilating and warming effects of the fan, are lost whilst, the atmosphere is, certainly not improved, but most probably vitiated, by being passed in a moist state, through a porous sulphureous carbon whereby it will tend to generate the two deleterious gases carbonic oxide and sulphuretted hydrogen, in a greater or less degree As a remedy Dr Ure proposes that the air be transmitted through a large sheet of wire-cloth, before it reaches the fan whereby it would be freed from the grosser particles of soot that pollute the atmosphere of London The wire-cloth should be brushed every morning

Secondly, the huge stove placed in the top story of the building, and consuming when in action three cwt of coals per day, tends to draw down foul air for its own supply from the chimneys of the adjoining rooms, and thus to impede the upward current created by the fan Dr Ure has measured, by Dr Wollaston's differential barometer, the ventilating influence of the said furnace-stove, and finds it to be perfectly insignificant—nay, most absurdly so—when compared with the fan, as to the quantity of fuel required per day. The rarefaction of the air in the stove chamber, in reference to the external air, was indicated by a quarter of an inch difference of level in the legs of the oil and water syphon, and this when the door of the stove-room was shut, as it usually is, the tube of the differential barometer being inserted in a hole of the door The fan indicates a ventilating force equal to two inches of the water-syphon, which is 20 inches of the above oil and water syphon, and, therefore, 80 times greater than that of the stove furnace so that, taking into view the smaller quantity of fuel which the fan requires, the advantage of ventilation in favour of the fan is the enormous ratio of 120 to 1, at the lowest estimate The said stove in the attic, seems to be not only futile, but dangerous, It is a huge rectangular cast-iron chest, having a large hopper in front kept full of coals, and it is contracted above into a round pipe, which discharges the burnt air and smoke into a series of horizontal pipes of cast-iron, about four inches diameter, which traverse the room under the ceiling, and terminate in a brick chimney. In consequence of this obstruction, the draft through the furnace is so feeble, that no rush of air can be perceived in its ash-pit, even when it is contracted to an area of six inches square nay, when the ash-pit was momentarily luted with bricks and clay, and the tube of the differential barometer was introduced a little way under the grate, the level of the oil and water syphon in that instrument was displaced by no more than one-tenth of an inch, which is only one-hundredth of an inch of water—a most impotent effect under a daily consumption of three cwt of coals "In fact," adds Dr Ure, "this stove may be fitly styled *an incendiary coal devourer*, as it has already set fire to the house, and, though now laid upon a new floor of iron rafter, and stone flags, it still offers so much danger from its outlet iron pipes should they become ignited from the combustion of charcoal deposited in them, that I think no premium of insurance adequate to cover the imminent risk of fire "

Dr Ure then proceeds to point out one striking and peculiar advantage of Messrs Easton and Amos's Heating and Ventilating Apparatus viz it may be modified at little expense, so as readily to introduce during the sultriest dog days, refreshing currents of air at a temperature of 10, 20, 30, or even 40 degrees under that of the atmosphere The above engineers, by the same plan—fans driven by steam-engine power—have successfully ventilated the letter carriers and inland-office departments of the General Post-Office, of which the atmosphere was rendered not only uncomfortable, but insalubrious, by the numerous gas lights required there in the evening

In conclusion Dr Ure premonitorily observes "As fans of sufficient size driven by steam power with sufficient velocity to warm in winter, and ventilate at all times the most extensive buildings, may be erected upon the principles above described without causing any nuisance from smoke it is to be hoped that the chapel of Henry VII will not be desecrated by having a factory Vesuvius reared in its classical precincts, and that the noble pile of architecture of the New Houses of Parliament will not be disfigured with such a foul phenomenon "

VAST CHIMNEY

ON September 26, the last stone of a stupendous Chimney was laid by Mr Blinkhorn, at his chemical works, Little Bolton The dimensions are 122½ yards, (367½ feet) high 127 feet 6 inches base, 108 feet inside, 21 feet on the top, and it has consumed 800,000 bricks, and 120 tons of stone The builder is Mr Ashton, of Bleakley —*Blackburn Standard*

ST ROLLOX CHIMNEY

THIS gigantic chimney, (noticed in the *Year-Book of Facts*, 1842, p 63,) has been completed, under the able superintendence of Mr A Thomson The extreme height from the ground to the cope-stone is 450 feet In relative height, independent of the elevation of its base, it is little inferior to the loftiest superstructure in the world; in absolute height, it towers into the air incomparably higher. The great pyramid rises 498 feet, but this includes a base of 150. Strasburg

Cathedral spire is 474; St. Peter's, at Rome, from ground to summit, 450 feet, being exactly the altitude of the *monstre* chimney. Its base under ground is 46 feet in diameter; at the ground, 40; and at the top, 13 feet 6 inches.—*Civil Engineer and Arch. Journal*, No. 60.

TERRA-COTTA STOVE.

On March 9, Mr. Green's Terra-Cotta Stove was described to the Institution of Civil Engineers, by Mr. Domville. In general nature, it resembles the thermometer-stove of Dr. Arnott, but in many points it is peculiar; and, for some purposes, Mr. Domville considered it possessed great advantages. One of the distinguishing features of the stove is, its freedom from rust or corrosion of any kind. In place of making the outside of the stove of iron, as is the case with the majority of those at present made, Mr. Green substitutes a cylinder of terra cotta, or earthenware. Another peculiarity consists in the introduction of two or three concentric cylinders of earthenware between the fire-pot and the external case; these are introduced to equalize the heat as much as possible, and prevent any danger of cracking the outer case of the stove.

FIRES OF LONDON.

In a lecture recently delivered at the Royal Adelaide Gallery, by Mr. Booth, on the Fires of London, their causes and prevention, he stated that in a period of five years there were in London no less than 2476 fires. These he divided, as regards their causes, into three classes, controllable, partly controllable, and partly uncontrollable; and after expatiating upon these classes, the lecturer proceeded to observe that, notwithstanding all the vigilance of inquiry that was adopted, there remained a large number of instances in which the causes were unassigned. These he endeavoured to ascribe to spontaneous combustion, observing that certain chemical combinations would take place in bodies, by which heat was elicited sufficient to ignite the bodies themselves, or any substance with which it might be in contact. The series of circumstances under which this took place was of a very important character, and sufficed to explain many fires of mysterious origin; and what confirmed this view of the case was, that many of the unknown fires originated in those trades in which substances were employed, in which spontaneous combustion was likely to take place. Mr. Booth enumerated fifty-five instances in which spontaneous ignition might ensue, many of which are well known, others of questionable authenticity. He then alluded to the occurrence of fires from very singular causes: amongst these were fires proved to have been produced by transparent substances, acting as lenses, and concentrating the rays of the sun; such as glass globes with gold fish, show-bottles in apothecaries' and chemists' shops, and water bottles in bed-chambers, which had each been known to ignite bed and window curtains. Coarse and blistered glass, used in sky-lights, had caused explosions in gunpowder manufactories; as had also lime, when used in the desiccation of that substance. Lime had likewise, by accidental flooding, set fire to many buildings where it was in contact with combustible substances. Under friction, Mr. Booth alluded to the danger of fire occurring from Congreve matches, stating that they were liable to ignite after they had been thrown away as useless; the inflammable material was also frequently thrown aside to a considerable distance, and might be productive of great mischief. On these accounts, their use should be prohibited in warehouses and manufactories where combustible matters are kept or used. Amongst the causes of mysterious fires, might also be enumerated the embers of tobacco and cigars, which, falling upon saw-dust, or being carried to hay-ricks, would prove their destruction, even after some time had elapsed, as they acted like touchwood, from the nitre which they contained.

Having entered thus minutely into a series of circumstances, little understood, and less guarded against, the lecturer stated, that by attention to the published causes of fire, great good would be accomplished. The number of fires continually occurring from overheated flues and stoves particularly demanded attention. The flues of buildings which had been constructed for heating merely by the simple combustion of wood or coal burned in open fire-grates, are not at all fitted to be exposed to the intense heat given off by several of the modern stoves. The great principle of these modern contrivances was to obtain and diffuse as large a proportion of heat from as small a surface as possible, and with the least consumption of fuel; and one of the means was limiting the draught of air. The air thus concentrated attains a very high degree of temperature, sufficient to ignite any combustible substances with which it may come in contact; besides which, the conductile power for heat of bricks and plaster becomes much modified by being constantly subjected to its influence. In this, Mr. Booth considers, lies the great secret of the destruction of many modern buildings; and the inquiry is of much public importance, because the causes of destruction may, even now, be in slow and insidious operation, to the eventual destruction of other national, and particularly sacred edifices, from the general introduction of new-fashioned stoves into such buildings. It was also, he remarked, notorious that there existed means of making buildings *fire-proof;* so that when a fire occurred, it might be confined to the apartment in which it originated.

We quote the above from Mr. Baddeley's *Resumé* in the *Mechanics' Magazine*, No. 969, wherein the number of Fires in London, in the year 1841, is stated to have been 696.

THE SOLAR LAMP.

Dr. Fyfe, in a paper "On the Use of Chlorine as an Indication of the Illuminating Power of Coal Gas, and on the comparative expense of Light derived from different Sources," read before the Royal Scottish Society of Arts, on January 10, thus illustrates the discovery of the newly-invented Solar Lamp.

"In this lamp, a cylinder surrounds that containing the wick, with the upper part bent inwards, so that the aperture being contracted, the current of air that passes up between the one cylinder and the other, striking against the horizontal part of the outer one, causes a contraction and lengthening of the flame, a longer and narrower glass chimney being, at the same time, required. The advantages said to attend the use of this construction of burner, are, that an inferior quality of oil may be used, while, at the same time, the light is greatly increased

"The Solar Lamp, containing *solar oil* with a flame as high as could be got to be steady, and without smoke, was contrasted with a gas argand, burning three feet per hour On comparing the lights, and taking the average number of trials, conducted at different distances, and when the wick was in different conditions, they were as 0 98 to 1, so very nearly equal, that we may consider them as so. The oil, per gallon, costs 3s 8d, a pint was found to burn eight hours, or very nearly so, at a cost of 5½d The gas required for the same time is 24, or say 25 feet, which would cost 2½d., accordingly the expense is rather more than twice, or say twice, that of the gas.

"To ascertain whether or not there is any saving by using the apparatus adapted to the Solar Lamp, the solar oil was consumed with a solar wick in the same argand with which the trials with the sperm and whale oils were made, and the light, as before, was contrasted with the argand, burning three feet per hour. The light and the consumption of oil were found to be the same as with the other oils. The cost of the solar oil per pint is 5½d, that of the whale oil 7d., accordingly, the expense is as the sort of the oils. It has been already stated that, by using the solar apparatus, the oil gave a light equal to that from an argand consuming three feet per hour, and that the pint of oil will last for eight hours, the expense is, therefore, as 2½d. to 5½d, or say 1d. to 2d. Now, when the solar oil was burned in the common argand, and contrasted with the gas argand, the light was as 1 to 2 54 As the oil lasted for twelve hours, the cost of gas for that time would be 3½d., or nearly so. The comparative expense was, therefore, as 5½d. × 2 54 to 3½d.; that is, as 3 98 to 1, whereas, by the solar lamp, it was only as 2 to 11; thus *making a saving by the use of the Solar Lamp of nearly one-half of the expense.* This peculiar construction of lamp is, therefore, a very great improvement, for, not only is there a saving in expense in the outlay for oil, but for the lighting of a large apartment a smaller number of lamps is required than when common argands are employed."

THE BUDE LIGHT IN MANCHESTER.

The Bazaar at Deansgate, Manchester, has lately been illuminated with Mr. Goldsworthy Gurney's patent Bude Light. The shop is 1280 feet in length and 48 feet wide, and contained formerly no fewer than 73 gas-lights, (12 of them argand burners,) which have been displaced by *four* Bude Lights. Not only is this new light more intense and beautiful than that of ordinary gas, but it is so pure and white that it does not cast a false glare on colours. Thus by it green be distinguished from blues at a considerable distance; and any small print can be more easily read by the Bude Light, at a distance of 48 feet, than by the common gas light placed just above it. Each of the lights proceeds from three concentric rings of tubing, with numerous perforations, in which is burnt the gas supplied from the Manchester gas-works; Mr Gurney's patent consisting in an apparatus, attached to the meter, for purifying the gas by passing it through a chemical mixture; and iron tubing being substituted for that of lead. The consumption of the purified gas by the large centre light in the bazaar is 80 cubic feet per hour; each of the smaller ones consumes 15 cubic feet in the same time.—*Abridged from the Shrewsbury Chronicle, September 23.*

THE BOCCIUS LIGHT.

THIS invention, named after the Patentee, Gottlieb Boccius, was first exhibited opposite Northumberland House, in the Strand, when its brilliancy excited considerable interest as to the means of its production.

In the specification, this new light is described as "certain improvements in the combustion of gas." The gas is supplied from a number of concentric rings, perforated with a vast number of small holes on their upper surfaces; that is precisely the plan adopted by Mr Gurney, in his Bude Light. Instead, however, of one chimney as usual, Mr Boccius applies, above the jet holes of the burners two or more concentric chimneys, or cylinders in addition to and within the usual chimney of glass. The body of the burners may be of any suitable metal; but, for the upper surface, through which the jet-holes are pierced, the patentee uses the German silver soldered into it, "on account of the high temperature required for its fusion."—In constructing burners of two or more concentric rings, the patentee places the inner ring at a certain height above the outer one or that next to it; thus to provide for the greater equality of the height of the several cylinders of flame in such burners so that they shall terminate as exactly as possible at one and the same level, and all enter the central chimney together. He finds by this arrangement that the economy or luminous effect arising from the combustion of a given quantity of gas, is much increased; an effect which he attributes in great measure to the circumstance that nearly equal luminosity is obtained in the flames from each ring at equal heights above the surface of the greater or external ring. As a general rule, the quantity of gas supplied, or height of the flame, should be such that its top is just received within the lower edge of the innermost central chimney. "When this is the case, the combustion will be found very perfect, and the light brilliantly white. No carbon will be deposited within any of the chimneys, and the light will be perfectly steady; the lower edge of the central chimneys defining the upper part of the light, so that the jagged or irregular edges and flickering so unpleasant to the eye in common gas-burners, does not exist, but the light appears of a permanent form, as a truncated section of a luminous cone."

The merit of this light has been much questioned. The Editor of the *Mechanics' Magazine* observes: "Its novelty is of a strange sort—whereas it has been generally considered advisable that the chimney of a lamp should cast as little shadow as possible, the second chimney of the Boccius lamp is made of solid metal, and casts a darker and deeper shadow than any we ever saw. Our present impression of this new wonder of the day is—that what is good in it is not new, and what is new is not good." Dr. Ure, too, has pronounced the Boccius Light to be a palpable imitation of the Bude Light.

THE NEW FRENCH LIGHT.

A FRENCH chemist of note has patented this improvement, both in France and England, through M. Charlieu, of Paris. Its main feature, (which forms the subject of the latter part of the patent,) consists in affixing to the centre of the burner an upright stem, or one stem to each hole of the burner. The liquid is conducted up to the burner by cotton yarn, and the flame keeps the stem heated; thus the liquid, as it comes up towards the burner, is volatilized, and the vapour to be consumed passes through the holes in the burner in a similar manner to gas. To light these burners, a hoop, surrounded with cotton or other fibrous substance, and provided with a stem, is employed. The hoop is dipped into some of the liquid and ignited, and then passed down over the burner below the upper part of the cotton yarn; by this means vapour is quickly produced in the burner, and passing through the holes in the same becomes ignited: the hoop is then removed, and the heat of the flame maintains the requisite supply of vapour.

This light combines all the advantages of gas, and also those of oil or tallow; for while, like the former, a constant and brilliant light is produced, and all difficulty and trouble of cleaning and trimming lamps are avoided, so at the same time all the advantages of portability and smallness of compass of the latter are retained. But one great feature of its superiority over both consists in an almost entire absence of smoke.

The liquid consists chiefly in distilling a mixture of some spirit, (naphtha, for instance,) and of some essential oil in certain proportions according to circumstances; generally of about twenty-three parts of essential oil, combined with seventy-seven parts of spirit of the strength of ninety-five degrees.

These details are abridged from the *Polytechnic Journal*. By referring to the *Year-Book of Facts*, 1839, p. 28, the reader will perceive that "The New French Light" closely resembles "The Patent Air-Light," an improvement upon Mr. Beale's Patent Lamp of 1835.

DRY GAS METER.

ON Feb. 15, Mr. Defries explained to the Institution of Civil Engineers, the construction and action of his Dry Gas-meter.

The instrument consists of a hexagonal case with three solid division thus formed is a flexible partition, to the centre of which fixed a plate, connected by a lever and shafts with the valves on th top of the case; by means of a combination of levers and crank with a worm and screw, a circular motion is given to dials, indicatin the quantity of gas which passes through the machine.

The gas, on entering the upper chamber, passes through the valv into the first division, and distends the flexible partition until th lever is carried to a certain point, when, by means of the connectin shaft, the inlet valve is closed, the outlet valve is opened, and th second division commences its action, which is continued by th third, thus producing an equal flow of gas; and an uniform motio is given to the counter-dials, which necessarily indicate the number times the divisions have been inflated and emptied, and thus measur the quantity of gas which has passed through in a given time.

UNFAIR GAS-METERS.

Mr. Flower, in a pamphlet on the Gas-meter, proves in wha manner it may be affected so as to show a false register of the quantit of gas consumed, to the great loss of the consumer. Thus:

"An undue quantity of water in a meter will make a difference o about twenty per cent. in the amount registered over the quantit actually consumed; but let the water in a meter be ever so nicel apportioned, still the consumer will sustain a loss of somethin like ten per cent. Blame, therefore, attaches to the consumer an to the companies, but more especially to the latter, who take goo heed that the meter shall not and cannot give more than a nomina 1000 feet for the 1000 feet registered, which my experience shows t be not 900 feet for the 1000; but they leave their tenants to ru the risk of defrauding themselves out of from one to twenty per cent of gas as well. If, as the companies construct their meters, that to little water in them will occasion an impossibility of obtaining a suppl of gas, why should they not be so gauged as to declare to th consumer, that if he has above a certain quantity of water in hi meter, he is registering water as well as gas?"

THE SOHO PATENT CANDLESTICK.

This improvement obviates the necessity of wasting any part of a candle, by merely twisting round the nozzle horizontally—and so gradually raising the candle, until every portion of the candle is consumed. It is greatly preferable to the old fashioned slides, which frequently become clogged, and in raising which the candle is liable to be pushed out; the action, too, is very simple.—*Railway Magazine.*

IMMENSE GUN.

The Largest Gun ever made in this country has been landed at the Arsenal, at Woolwich. It weighs nearly eighteen tons. The labour of conveying it to the butt showed great ingenuity; being effected by a coil of strong rope around it, moving the immense mass in a rolling manner, along four large logs of wood, changed alternately as the gun progressed. This gun is made on the howitzer principle, and is about twelve feet long, with an immense quantity of metal at the breech. The diameter of the bore is within about one-tenth of sixteen inches. The weight of solid shot with which it will be fired is 455lb. and shells of 300lb.; and it is expected two solid shot of that weight, and four shells in the same proportion, will be used when it is proved at the butt. This howitzer was cast and bored for Mehemet Ali, Pacha of Egypt; and two other large guns, 130-pounders, were landed at the same time, to be proved for service in Egypt.

NEW GUN.

On October 24, some Experiments were performed at Woolwich, with a new description of Brass Gun, invented by Captain Grant, of the Royal Artillery. This handsome piece of ordnance has been constructed upon a different principle from that of any hitherto used; and the results of six rounds fired on the above day have shown it to be admirably adapted for field service. From the diameter of the bore being 4 1/16 in., the Gun has been denominated a light 9-pounder. It is, however, so well-proportioned, that it weighs only 10 cwt. 1 qr. 9lb., while the other 9-pounder guns at present in use average 13½ cwt. This advantage will effect a great saving in metal valued at £138. per ton. But the most important saving will be attained when used in exercise, and in field warfare, as there is a difference of fully 4 cwt. in favour of Capt. Grant's Brass Gun and Carriage; 3½ cwt. nearly on the gun, half cwt. on the carriage and timber, and 34 lb. less weight of powder when supplied with 48 rounds of shot and ammunition. The experimental firing took place from a range of 1200 yards; the first shot was fired at an elevation of three degrees, and the recoil was 8 ft. 9 in.—about the usual distance. The second shot was fired at an elevation of 3½ degrees, and the recoil was then only 7 ft. 9 in. None of the remaining shots exceeded in recoil 8 ft. 2 in., and the fourth only recoiled 7 ft. 2 in.; while the whole of the balls, with one exception, reached the target, the other having fallen about 100 yds. short, probably owing to the taking of the elevation. The saving in powder will be three-fourths on each time Captain Grant's Gun is fired; his charge being 2¼lb., and the present charge being 3lb. for a gun of the same calibre. From the elegance of the model, lightness, and at the same time ample strength of the carriage, this Gun is likely to be introduced into the service, and it will be far easier of draught for the horses.—*Times*, *Oct.* 25.

IMPROVED FOWLING-PIECE.

M. Matthieu has invented a Gun, which, immediately after it is discharged, recocks itself, and conveys a new charge in the direction of the barrel. This is repeated with such rapidity that the gun can be discharged five times in three seconds; or the action may be stopped for any time between each discharge. The combinations of the mechanism are such as to prevent accidental explosion. This invention is not new. Baron Heurteloup, more than two years ago, produced a fowling-piece and a musket on this principle; and he i stated to have made such improvements, that double the number o the charges of M. Matthieu's gun may be fired in almost the sam space of time.—*Civil Engineer and Architect's Journal*, No 62.

LOADING AT THE BREECH

SOME very successful Experiments were made in Woolwich Marshe on August 17th, with two 24-pounder guns loaded from the breech constructed according to a plan invented by Baron Wahrendorff o Stockholm We quote the following account from the *Times* —Eigh rounds only were fired at a range of 1,250 yards, four of the sho being covered with a thick kind of serge, and four with lead abou two-tenths of an inch thick The object to be gained by Baro Wahrendorff's invention is to be able to load the guns used on boar of vessels at sea from the breech, many valuable lives having been los during the last war by the difficulty of running out and in the gun when naval engagements took place. The loading at the breach i effected on this plan —by having the gun bored all through, an after putting in the ball first from the breech end, then the charge o powder, and lastly a chamber amply secured and air tight, that n danger may occur at the rear The firing was good, the second bal entering the target at the long range of 1,250 yards The charge o powder was two pounds less on each round, and it was found t give the shot a greater elevation than by the common practice, whic was easily accounted for, as the covering of lead gave less windage It was observed that the shot covered with lead caused a recoil o about a foot more than the recoil of the gun charged with sho covered with serge"

NEW CHEVAUX-DE-FRISE

M DE GRANGE, an engineer at Lyons, has invented a machine o this description, which is composed of a globe of brass of three o four inches in diameter, fixed to an iron handle the thickness of a finger, about three and a half feet long, with a spike at the end The globe or ball is perforated with twelve holes, so arranged as to admi of as many lances of the same length as the handle These lances are fixed in the globe by means of iron pins, and when set up, form a defence of about seven feet in height, and as many in length. A body of infantry arriving on a plain furnished with these Chevaux-de-frise, to the extent of double the line it is to form, that is to say, sufficient to cover its front and rear, in the proportion of one fo every seven men, one of whom carries the ball and its handle, and eac of the six others two lances, can, says the inventor, form itself i order of battle, and, on the approach of an enemy's cavalry, plant th chevaux-de-frise in its front and rear to keep them off, and thus th first and third ranks will be enabled to fire in line, without the loss o time and frontage occasioned by forming the troops into a hollow o a solid square.—*Mechanics' Magazine*, No 998

MINING EXPERIMENTS.

On October 25, the following very interesting Experiments, illustrating the Methods of Blowing-up Stockades, Bridges, Counter-Scarps, &c., and also showing the Mode of Attack with the Hand-Grenades, were exhibited on the engine-ground for field-practices at Chatham, under the direction of Sir Frederick Smith, Lieutenant-Colonel of the Royal Engineers.

The first operation:—Breaching a Stockade, commenced by Lieut. King placing his charge of four bags of gunpowder, (each containing 60lb.) on the west side of a very strong stockade, erected for the purpose; three bags of powder being placed on the lower tier, and one on the upper. The bore was attached to the middle bag of the lower tier; and the other end passed through the Stockade to the east side, two inches of port-fire being attached. The signal being given, Lieut. King, with a party of ten Sappers, immediately debouched from St. Mary's Guard, across the creek, in a pontoon-raft. The Sappers carried four bags filled with sand (representing gunpowder); and these being quickly placed on the eastern side of the stockade, at a given signal the train was fired, and the Sappers retreated as quickly as possible. The experiment was perfectly satisfactory: the explosion took place within two minutes of the light being applied to the port-fire, and the stockade was riven in pieces. The breaching party then advanced, augmented in numbers, under the command of Lieut. Lovell, provided with hatchets, and passed with great rapidity round the breach, taking possession of the first parallel and the batteries, from which rounds of artillery were immediately fired.

The next operation was the Attack of a Block-house, (similar to those erected in American warfare,) by a party under the command of Lieut. Grain, with hand-grenades: the 40 men threw combustibles into the Blockhouse, and then retreated behind the adjoining parapets, until the missiles burst within the log-house, and tore the planks of which it was constructed into holes and fissures.

The third operation was Blowing off the crown of the arch of a strongly-built Bridge, which was effected by a *minimum* charge of gunpowder; the explosion being terrific. The brickwork was hurled several hundred feet into the air, and the fragments carried to a distance of several hundred yards. Two operations upon the pieces of the bridge were then performed with equal success, and the whole mass was overthrown with a formidable explosion.

The last operation:—the Blowing away a portion of a Counterscarp, in order to enable the depression of guns to an angle to bear upon a battery—was the most curious. This experiment was equally successful with its predecessors: the earth was blown away with tremendous noise and force, and the object intended fully accomplished.

The whole of the operations were carried on with the precision and accuracy of actual warfare; the troops employed, viz. the Engineers, were manœuvred as in an actual attack, and the whole conducted according to the strict rules of the military art. There was, at intervals, and after the termination of the mining, some excellent practice with 24-pounders by the Gunners of the East India Company. —*Abridged from The Times, Oct.* 26.

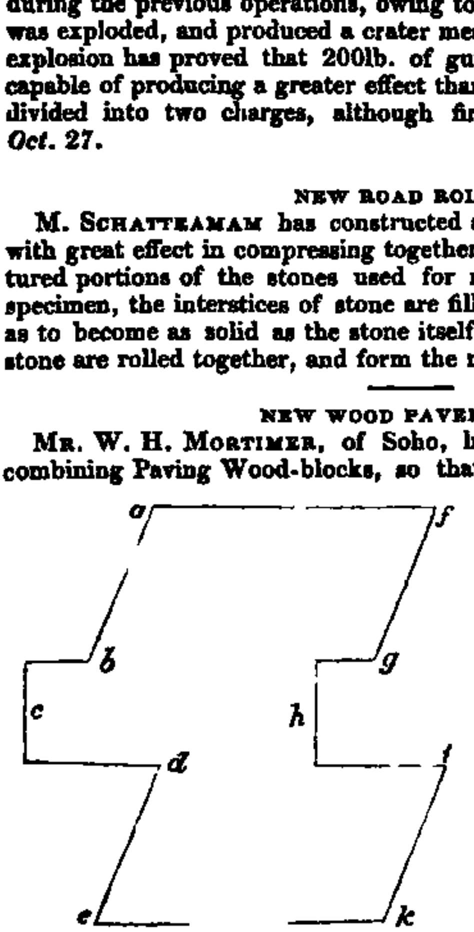
Towards the close of the day, one of the mines which did not ignite during the previous operations, owing to a slight defect in the priming, was exploded, and produced a crater measuring 40 feet in width. This explosion has proved that 200lb. of gunpowder fired in one mass is capable of producing a greater effect than the same quantity of powder divided into two charges, although fired simultaneously. — *Times, Oct.* 27.

NEW ROAD ROLLER.

M. Schatteamam has constructed a Roller, which has been used with great effect in compressing together into one solid mass the fractured portions of the stones used for macadamizing roads. In one specimen, the interstices of stone are filled with sand, compressed so as to become as solid as the stone itself; in the other, fragments of stone are rolled together, and form the most complete adhesion.

NEW WOOD PAVEMENT.*

Mr. W. H. Mortimer, of Soho, has patented a new mode of combining Paving Wood-blocks, so that each block having its two opposite sides reversed in their cut, they will go together and support each other. The annexed figure shows a block.



The patentee does not confine himself to making the inclined surfaces according to the precise angles shown.

The claim is to the mode of constructing blocks for covering roads and ways, by combining the inclined surfaces *a b* and *d e* with the tongue *c*, and forming on the opposite sides of the blocks the corresponding inclined surfaces and grooves, *f g i k* and *h*.

Mr. R. Gurney, of Trewinyon House, Cornwall, has also patented a new method of cutting wood, and incrusting the same, so as to "present a sure footing for horses, and prevent water passing through the crevices of such wood."

A beam is sawed at its extreme length at right angles, and squared on all four sides; it is then laid down with one edge upward, and sawed edgewise, the saw being held in an oblique direction, so that it deviates from the right angle downward and sidewise. The block thus produced is to have all its sides equal. In paving, each block is to be so placed as to lean equally on two other blocks, whilst two more blocks lean upon it. The blocks being so laid down as to present the appearance of a diamond lengthwise, that is with the two sides which incline so as to lean on two other blocks away from the spectator, and the two sides which support two other blocks next to him, it will be found that all the weight of the block is thrown forward on the farther point, the two sides of which rest on two other blocks. Mr. Gurney says: "I consider that this cut is perfect in itself, and may be used with or without incrustation." The block thus cut may be incrusted with, or cemented to the next block by a composition of asphalte, bitumen, black-lead, gas-tar, and other adhesive materials. In general, the composition need only be applied to the sides and bottom. When it is deemed requisite to incrust the top, or upper surface, the following process must be followed: the wood is first to be steamed to render it soft and porous, and a mixture of asphalte and bitumen with gravel strewn on it is then to be beaten into the wood by rollers or mallets.

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* See also, Year-Book of Facts, 1842, p. 34.

The rhomboidal blocks introduced by the Count de Lisle embrace the peculiarity of a system of wedging, dovetailing, or mortising and tenoning, which gives to the whole mass of the pavement a degree of stiffness and tenacity superior to the other forms which have hitherto been tried. The hexagonal prisms appear to require more care in accurately fitting and fixing them. It is to be regretted that due attention has not hitherto been paid to this important point, and also that, in the first trials of the prisms, the foundation on which they were laid was very imperfectly prepared. The proprietors of both kinds of wood-paving adopt at this time a very expensive foundation of gravel and Roman cement. This occasions a very unnecessary expense, because a good lime concrete of the same depth would answer just as well, with only this drawback, that it would require a longer time to set hard. This, however, could form no serious objection, where a considerable extent of the paving had to be laid down at one time.—*Surveyor, Engineer, and Architect,* No. 29.

Sir J. Robison has also explained to the British Association a new description of Wood Paving Blocks introduced in Paris. They use circular blocks instead of hexagons, and the blocks are supported one by another. One-sixth of the circumference of the block is cut out with a radius equal to the radius of the block, three of these grooves are made at equal distances to half the depth of the block; and then three similar grooves are cut in the lower half of the block, but so that the grooves above be vertically over the portions left untouched in the lower half: thus, each end of the block shows three flutes or grooves, and three projections. When the blocks are put together, it is manifest that the groove in one fits the projection in the next one, which, at the same time, receives the lower half of the other, thus each supporting and strengthening its neighbour.

Wood Paving has now been pretty extensively adopted in the metropolis, and a great part of the line from the Mansion-house by Oxford Street to Regent Street, and by the Strand to Westminster Bridge, is laid with it, and, doubtless, these several portions will be shortly united. In the large parish of Marylebone, has been formed "A Practical and Scientific Association for the Promotion of Improved Street Paving," who especially patronize wood pavement. It may here be mentioned that, so long ago as 1835, Mr. Bradwell, the machinist of Covent Garden Theatre, submitted to the City Paving Commissioners, a system of wood paving, but the plan was rejected by the authorities.[*]

In the *Civil Engineer and Architect's Journal*, No. 59, all public bodies, who are about to adopt wood paving, are strongly recommended to "take the precaution of having a good bed of concrete; of Thames sand and stone lime, with a small portion of Roman cement and puzzolana. As to wood without concrete, it is quackery, and a waste of money."

The wood pavement laid down at the east end of Oxford Street, four years since, has been reversed and relaid, when many of the blocks were found to be not reduced half an inch of their original length, which was one foot.

KYANIZING TIMBER.

ON March 8, Mr. Timperley described to the Institution of Civil Engineers, the process of Kyanizing Timber in close vessels, by using exhaustion and pressure, instead of in the open tanks generally employed. The apparatus consists of two tanks, a reservoir, two force pumps, and a double air-pump. The tanks are cylindrical, with flat ends, and are made of wrought-iron plates, nearly half an inch in thickness. They are 70 feet in length, and 6 feet in diameter. At each extremity is a cast-iron door, flat on the outside, and concave on the inner side, provided with balance-weights for raising and lowering it. Each end is strengthened by five parallel cast iron girders, whose extremities are held by wrought-iron straps, riveted on to the circumference of the tanks. Notwithstanding the great strength of these girders, several were broken by the pressure applied during the process. The vessels are lined with felt, upon which is laid a covering of close-jointed fir battens, fastened with copper rivets. This precaution is necessary to prevent the mutual deterioration which would arise from the contact of the iron and corrosive sublimate. There was originally only one brass force-pump, 2 inches diameter, and 6 inches stroke. This being found insufficient, another was added of 4 inches diameter, and henceforward a pressure of 100lbs. per square inch was easily obtained. The air-pump is 10 inches diameter, and 15 inches stroke. Its construction is of the ordinary kind.

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[*] The backwardness of official bodies in adopting the most obvious improvements in the metropolis, is very extraordinary. Twenty years have elapsed since an ingenious Frenchman brought to London specimens of enamelled "street names," with letters of introduction to the civic authorities, not one of whom could then be found to countenance the innovation.—*Ed. Year-Book.*

The process is simple and rapid: the corrosive sublimate is fi mixed with warm water in a trough, in the proportion of 1lb. of the former to 2 gallons of the latter; the clear solution is then poured off into the reservoir, where water is added till it is diluted to the proper point, which may be ascertained by a hydrometer. A more perfect test is the action of the solution upon silver, which it turns brown at the requisite degree of saturation. The operations of exhaustion and pressure employ eight men for five hours, the whole process occupying about seven hours, during which time from 17 to 20 loads are kyanized in each tank. It is desirable that the timber should remain stacked for two or three weeks after kyanizing, before it is used. It was found that about ¾ lb. of corrosive sublimate sufficed to prepare one load, (50 cubic feet,) of timber. About 337,000 cubic feet of timber were kyanized, the average expense of which, including part of the first cost of the tanks, was about 5d. per cube foot. The timber was tested after the process, and it was found that the solution had penetrated to the heart of the logs.

FEATS OF STRENGTH.

The following extraordinary Feats of human Strength and Endurance are related, in the *New York Courier and Inquirer*, to have been exhibited at the Bowery Theatre. It was announced in the bills that M. Paul was to resist the power of two of the strongest horses to be found in New York, for a wager of 1000 dollars. The animals selected to pull against him were a pair of large-sized Pennsylvania-bred horses, which are in the daily habit of drawing from two to three tons of granite at a load, on an enormous truck. Paul, after firing a cannon weighing 400lb. from his shoulders, and ascending the fireman's rope, feet uppermost to the flies, by means of his hands alone, and performing other Herculean feats, placed himself horizontally upon a strong oak ladder, in order to make the grand effort. The horses were led on by their regular driver, and harnessed to a rope fastened to Paul's feet. To this rope were attached three broad ribands or girths, one of which was drawn tightly over his loins, and the others over his shoulders. The brace afforded by his feet against the step of the ladder, the divided power of the girths, and his hold with both hands upon the upper part of the ladder, constituted his only resistance to the immense power he had to contend against. Paul's body, when thus disposed, resembled that of a malefactor upon the rack, preparatory to being torn to pieces. When the colossal horses were brought upon the stage, and attached to the feet of the intrepid performer, a sensation of horror seemed to pervade every part of the house. The word was given—the harness straightened—the ladder creaked and strained—the two ropes by which one end of it was secured to the stage stretched and threatened to break: the horses, aided by a platform upon the stage, with cleets to brace their feet, strained every muscle and vein—the well-known voice of the driver—the lash repeated again and again—all failed to force the

the withdrawal of the horses, proclaimed his triumph! M. Paul attained his 18th year in March last.

STRENGTH OF MATERIALS.

MR. HODGKINSON has reported to the British Association, a summary of results of very numerous Experiments on Marbles and Stones of various degrees of hardness; from which it appeared that the ratio of the crushing force to the transverse force is nearly the same in glass, stone, and marble, including the hardest and the softest kinds. Hence, if we know the transverse strength, or the crushing strength, in any of these bodies, we may predict the other; and as glass and the hardest stones resist crushing with from seven to nine times the energy that they do being torn asunder, we may get an approximate value of the tensile force from the crushing force, or *vice versâ*. These results render it probable that the hardest bodies, whether cast-iron, glass, stone, or marble, admit of certain atomic displacements either in tearing asunder or crushing; these displacements being in a given ratio to each other, or nearly so. In future calculations as to the strength of bodies, the crushing strength ought to be made the fundamental datum. The ratio of the transverse strength to the crushing strength is greater in cast-iron than in glass, marble, and sandstones, arising from the ductability of that metal. The necessity of enlarged inquiries in these matters will be seen when it is reflected that calculations of the transile strength of cast-iron, or marble, or stones in general, made from the transverse strength by the modes used by Tredgold, Napier, and others, give the transile strength twice or three times as great as it ought to be.—*Lit. Gazette*, No. 1330.

ANCIENT WATER-WHEELS IN THE EUPHRATES.

THE only obstacle to the navigation of this river consists in the remains of the water-wheels used for irrigation. In the short space of 130 miles, are nearly 300 of these wheels, about one-third of which are in operation at the present day. They consist of large parapet walls built into the stream, directing the current of the river to the wheels, which are the most clumsy pieces of mechanism, made of branches of trees, and having slung round them 150 clay vessels to raise the water in. The wheels are 40 feet in diameter, placed at the end of an aqueduct, raised upon well-built Gothic arches. They are the nearest approach to perpetual motion; and it is surprising the quantity of water which they raise to the surface. They cause a current of six or seven knots, with a fall of two or three feet where they are, so that this part of the river is difficult, and somewhat dangerous; but, as it is, we have surmounted all. The genius and skill of Messrs. J. Laird and Macgregor, who furnished the boats and engines, have overcome obstacles which baffled the well-disciplined legions of Trajan and Julian, when they went to besiege Ctesiphon, and failed to drag their fleets against the stream on account of the current.—*Account of the Euphrates Expedition, in the Times.*

PATENT WATER ELEVATOR.

On May 18, Mr. Walker explained to the Society of Arts, his Patent Water Elevator. The principle of action of this machine is momentum It is simply a pump-barrel or tube, fitted with a common spindle-valve, opening upward, near its lower extremity. The lower end of the tube being immersed in the water, a reciprocating vertical motion, of very short range, and of considerable velocity, is communicated to it by attachment to a short crank. The quick motion is produced by connecting a small drum on the crank-shaft with the large driving-wheel. The up-stroke of the tube having communicated momentum to the water within it, the tube is suddenly forced downward before the upward motion of the water is destroyed by gravitation, an additional quantity is admitted through the valve, and when the tube is filled, the water is discharged in a continuous stream from the upper end, which is curved for the convenience of delivery. Oats and other solid bodies were drawn from the well by the pump, and delivered with the water in large quantities. The object of this experiment was to show that, as it is very difficult to choke this machine, it is particularly adapted to the purpose of a ship's pump.—*Athenæum*, No. 760.

DISC HYDRAULIC ENGINE.

A very complete Hydraulic Apparatus has been constructed on the principle of the disc engine, by the Birmingham Disc Engine Company, and impelled by a steam-engine on the same principle The engine, boiler, and hydraulic apparatus, are all contained in a small canal-boat measuring 50 feet in length, and 7 in width The engine and apparatus, without the boiler, occupy a space of only 12 feet by 6 feet. The quantity of water raised has been ascertained by measurement, and found to be equal to 4,000 gallons per minute, or nearly 40,000 cubic feet per hour.—*Midland Counties Herald.*

THE TURBINE *

On March 22, Prof. Gordon detailed to the institution of Civil Engineers, the invention of the Turbine, and its advantages, which he stated to be —

1st. That they are with like advantage applicable to every height of fall, expending quantities of water proportional to the square root of the fall, their angular velocities being likewise proportional to these square roots.

2nd. That their net efficiency is from seventy to seventy-five per cent.

3rd. That they may work at velocities much above or below that corresponding to the maximum of useful effect, the useful effect varying very little from the maximum nevertheless, and—

4th. They work at considerable depths under water, the relation in France, and which, through all the mutations and revolutions of the French people, has been in constant use in that country for forty-eight years. M. Gonon was led to believe that he could correspond, word for word, without using more signals than words; which ample experiments, since had, have proved beyond doubt. In view of these experiments, he is led to assert that, with thirty observations between Washington and New York, he could transmit from the latter to the former city the words—"The British fleet, three ships of the line and five frigates, appeared off the Hook at thirty-two minutes past ten,"—in five or six minutes.—*Baltimore American.*

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* See also Year-Book of Facts, 1839, p. 68, 1840, p 83, 1841, p. 73.

THE ASTRONOMICAL CLOCK AT STRASBURG.

THE celebrated "Great Clock of the Cathedral Church of Strasburg," which had been out of repair for several years, has been completely renovated by a M. Schwitgue, after four years' labour. It was exhibited to the Scientific Congress, lately held at Strasburg, where it excited considerable interest among the *savans.*

This clock has long been famed for the great variety and complication of its movements: it was begun some time in the year 1352, and erected into the spire of the cathedral in the year 1370. It was, however, much altered from the original, if not entirely removed, by Conrad Dasypodius, Professor of Mathematics in the University of Strasburg; it was finished in the space of three years, having been begun in May, 1571, and finished June 24, 1754. In the years 1625 and 1630, it was struck by lightning; and it was not repaired for several years after.

The details of this clock will be found in nearly every treatise on Horology *; and they have been copied into nearly every cheap periodical publication of our day, illustrated with an engraving of the clock, from an old print. Nevertheless, as some alterations may have been made in the recent repairs, we quote the following description from the foreign journals.—The clock is composed of three parts, respectively dedicated to the measure of time, to the calendar, and to astronomical movements. The first thing to be created was a central moving power, communicating its motion to the whole of the mechanism. The motive power, which is itself a very perfect and exact time-piece, indicates on an outer face the hours and their subdivisions, as well as the days of the week: it strikes the hours and the quarters, and puts in motion divers allegorical figures. One of the most curious of these is the genius placed on the first balustrade, and who turns, each hour, the sand-glass that he holds in his hand. The cock crows, and a procession of the apostles takes place each day, at noon. In the calendar are noted the months, days, and dominical letters, as well as the calendar properly so called, showing all the saints' days in the year. The plate on which these signs are marked, revolves once in 365 days for the common, and 366 for the bissextile, year; marking, at the same time, the irregularity which takes place three consecutive times out of four in the secular years. The moveable feasts, which seem as though they followed no fixed rule, are, nevertheless, obtained here by a mechanism of marvellous ingenuity, in which all the elements of the ecclesiastical computation—the millesimal, the solar circle, the golden number, the dominical letter and the epacts—combine, and produce, for an unlimited period, the result sought. It is at midnight of the 31st of December that the other moveable feasts and fasts range themselves in the calendar, in the order and place of their succession for the whole of the following year. The third division solves the problems of astronomy. It exhibits an orrery, constructed on the Copernican system, which presents the mean revolutions of each of the planets visible to the naked eye. The earth, in her movement, carries with her her satellite, the moon, which accomplishes her own revolution in the space of a lunar month. Besides this, the different phases of the moon are shown on a separate globe. One sphere represents the apparent movement of the heavens, making its revolution in the course of the Sideral day. It is subjected to that almost imperceptible influence known as the precession of the equinoxes. Separate mechanisms produce the equations of the sun, its anomaly and right ascension. Others, the principal equations of the moon; as its erection, anomaly, variation, annual equation, reduction and right ascension. Others, again, relate to the equations of the ascending node of the moon. The rising and setting of the sun, its passage to the meridian, its eclipses, and those of the moon, are also represented on the dial.

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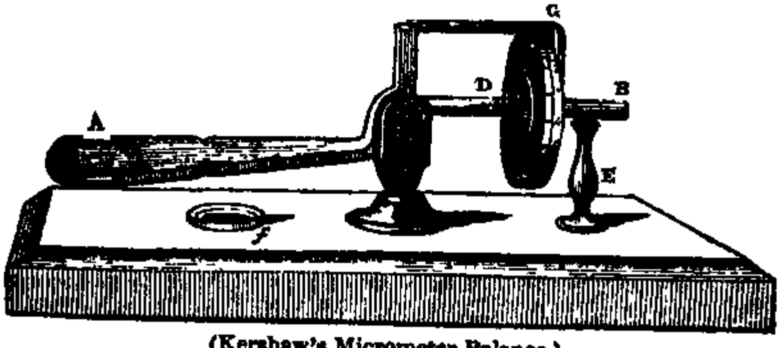
* The repair of this clock has, however, been recorded by some of the journals of the past year as a new construction. We may here direct the reader's attention to a valuable little treatise entitled "Time and Timekeepers," published during the year, by Mr. A. Thomson, of New Bond Street; it abounds with accurate historical details and practical information.

MICROMETER BALANCE.

Mr. W. Armstead has invented the machine represented in the accompanying sketch. It consists of a beam, or steelyard A. B., sup-



(Kershaw's Micrometer Balance.)

ported on a knife-edged fulcrum at *c*; about midway on the cylindrical portion of the beam (B) a few threads of a screw are cut, upon which a Micrometer wheel D, tapped to correspond, turns freely; the rim or periphery of this wheel is divided into half-grains, each of which extends over a space equal to one-quarter of an inch.* When not in use, the end of the beam B rests upon a pillar or supporter B.

To use this balance, the micrometer wheel is turned back towards B, until the zero, or full-weight mark, is immediately under the index bar G. If the coin be deficient, the wheel is turned forward until an equilibrium is obtained, when the value of the actual deficiency will be shown in pence by the figures on the periphery of the wheel. When half-sovereigns are to be tested, the supplemental weight *f* is employed, and the deficiency is indicated as before.

By this balance, the use of small weights, and the necessity of calculations, are entirely obviated.—Mr. Baddeley, in *Mechanics' Magazine*, No. 990; *abd.*

NICE MEASUREMENT.

M. Lebonart, a watchmaker, of Berlin, has constructed a Clock, which marks not only the hours and minutes, but even the thousandth parts of a second. An additional circle is made for this purpose, outside the others, and a needle marks the thousandth part exactly. He has applied this invention to the measurement of the speed of cannon-balls, so that the ball in leaving the cannon, sets the hand in motion; and galvanic wire affixed to the mark, and communicating with the hand, stops it the moment the ball reaches its destination.—*Galignani's Messenger.*

OMNIBUS INDICATOR.

Mr. W. Knight, of Durham Street, Strand, has patented the invention of an Indicator for registering the number of Passengers using an Omnibus or other carriage. The invention consists of a counting or registering apparatus, contained in a box or case affixed to the side of the vehicle; which apparatus is acted upon by the axle of a revolving shaft, placed across the upper part of the doorway or entrance to the carriage. Through this shaft are placed two pairs of arms or levers, sliding at right angles to each other, one pair lying horizontally under the roof, while the second pair hang down against the door, and are moved by each passenger that enters the vehicle; thereby causing the ratchet wheel to be moved one tooth, which numbers one in the unit cylinder.

DETECTOR PADLOCK.

Messrs. Chubb and Son have manufactured an extremely small Detector Padlock, of gold, and weighing only 17½ grains; but containing all the ordinary mechanism, and even the detecting apparatus, of a complete lock. It is set in an ordinarily sized ring; and the proportions of the lock are so minute, that, except upon close inspection, the skill which has been expended upon it would escape observation.

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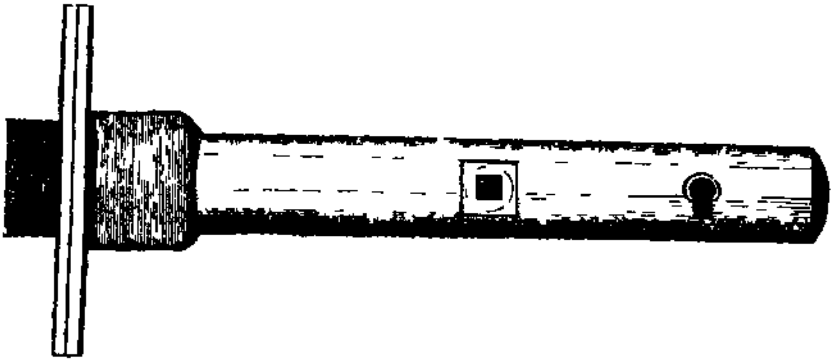
* By increasing the diameter and diminishing the thickness of the wheel, a still larger indication can, of course, be obtained. The machine has been "brought out" by Mr. Kershaw, of Wilderness Row, and it bears his name.

PATENT ALARUM LOCK.—NEW BROOM.

On April 20, the Patent Alarum Lock, of Messrs. Thomson and Co., was explained to the Society of Arts:—Mr. Domville opened the lock, and showed it to be so contrived, that before the key could be introduced, a circular plate, which covered the key-hole, had to be removed; and that in doing so a bell was struck any number of times, from one to thirty, according to the will of the owner. A lock, with a somewhat similar arrangement, which was rewarded by the Society in 1836, was also exhibited; the principal difference being, that the latter rings the bell in the act of locking and unlocking, while in the former it is a preliminary measure. The attention of the meeting was next called to the Reversible Broom, which, by a very simple contrivance, enables the broom to be worn fairly out by means of a shifting handle, instead of on one side only, as is the case under the old plan, where the handle is fixed in one direction only.

PATENT CYLINDRICAL MORTICE LOCK.

This Lock, patented by Mr. Gerish, and shown in the annexed engraving, of half the real size, merits general attention, from the simplicity of its construction, and the easy manner in which it can be fixed to doors; the portability of the key, and the security it affords. It will be seen that by merely boring a hole with an auger in the door, it is at once fixed; thereby saving considerable time in cutting a large mortice, which frequently injures the door. There is only one bolt, for the purpose of locking it; there is a contrivance at the back or end of the bolt; by turning the key a lever or tumbler is let down, which prevents the latch-bolt being turned back. The Mortice Lock before us, strong enough for a room-door, is six inches long, and three-quarters of an inch in diameter.—*Civil Engineer and Architect's Journal*, No. 57.



(Gerish's Patent Cylindrical Mortice Lock.)

BANK-NOTE MACHINERY.

On June 7, was read to the Institution of Civil Engineers, a paper from Mr. T. Oldham, the Engineer to the Bank of England, describing the method of numbering and dating Bank notes by machinery in that establishment; and the improvements introduced upon Bramah's numbering press, by his father, the late Mr. Oldham, and himself. The description was, of course, too technical for general readers; suffice it to say, that by these improvements, instead of, as in Bramah's press, producing only units, and bringing round the tens and hundreds by hand, Oldham's press effects numerical progression from 1 to 100,000, with unerring precision. Mr. Oldham explained that he had carried the machine still further, and by an arrangement of wheels and polls could continue printing to an unlimited numerical extent, with presses properly constructed.—*Athenæum*, No. 763.

BRANDING DESERTERS.

An Instrument has recently been invented for marking Deserters: it is of brass, shaped at the end into the form of D, from the outline of which is protruded, by means of a spring, a series of needle points, which are regulated by a screw at the end, and by turning which, their length may be increased or diminished. By pulling back the nut of the screw, after the points are regulated, they recede into the box, when the instrument may be considered charged. A slight pressure on a small brass lever delivers the needle-points, inflicting a puncture on the skin of the exact shape of the instrument. These punctures, on being rubbed with a marking fluid composed of a quarter of a pound of pulverised indigo, two sticks of Indian ink, and enough water to render it liquid, leave an indelible D upon the hand or arm of the deserter; and there is no possible means by which the marking can be accomplished with less pain and more certainty.—*United Service Museum.*

PATENT WIRE-ROPE.

This Rope is likely, on account of its economy, to become of extensive use for forming foot-bridges over canals and deep cuttings of railways. Two wire-ropes, made at Mr. A. Smith's works, at Poplar, 100 feet long, 2½ in. in circumference, and weighing 2½ cwt., cost 5*l*. 5*s*., and form the main chain for a suspension foot-bridge on the South-Western Railway, near the Weybridge Station.—*Civil Engineer and Architect's Journal*, No. 57.

CASTING THE SPECULUM OF THE EARL OF ROSSE'S TELESCOPE.

Sir James South has communicated to the *Times*, April 27, a brief description of the casting of the Speculum of this Leviathan Telescope, of which the following is an abstract. In the absence of diagrams, Sir James provides the following substitute:—

"Make one extremity of a line 4¾ inches long, bisect a perpendicular to itself of 2½ inches long, and the other extremity of it bisect another perpendicular to itself of 2 3-10 inches; beyond which perpendicular extend the first-named line 2½ inches.

Call the first, the crane line; the second, the chimney line; and the third, the mould line.

On the crane line, at the distances from the chimney line of 1 2-10 inches, 2 4-10 inches, and 3 6-10 inches, make dots. On the first of these dots place, centrally, a silver fourpence; on the second, a silver penny; on the third, a sixpence; on the centre of the chimney line, a shilling; on each of its extreme points, a silver fourpence; on the centre of the mould line, a crown; on each of its extreme points, a sixpence; and on the uncovered extremity of the crane line, a card of 2 inches square; so that its sides shall lie either parallel with or perpendicular to the crane line.

Now, supposing these several coins and card to have the same thickness as the silver fourpences, the *tout ensemble* will indicate an horizontal section of the foundry; for the three fourpences will represent the crucibles in their furnaces, the shilling the chimney, the penny the crane, the crown the bottom of the mould, the sixpences the iron pouring-baskets, and the card the floor of the annealing oven.

The crucibles were of cast-iron, 24 inches interior diameter, and 30 inches deep, each weighing about half a ton. They were kept *in situ* above the bars of the furnaces by cast-iron supports and subjacent brickwork.

The furnaces, about 5½ feet square, were brick; their fuel apertures were 4 feet diameter; their height above the gratings, 8 feet; their ashpits, 2 feet; and their several flues passed into the chimney, which was 5½ feet square at bottom, and in height was many yards.

The iron pouring-baskets were supported on wooden frames, and were supplied with pivots; one pivot of each basket having had welded on it at a convenient angle an iron lever about 3 feet long, by which the basket, with its contents, was turned on the pivot of the former without difficulty.

The bottom of the mould, 6 feet 8 inches in diameter, was formed of iron hoops, packed as closely as possible side by side, their edges up, and turned in the lathe till the upper surface had imparted to it a convexity necessary to produce the wished-for concavity in the surface of the speculum when cast.

A half-crown placed centrally on the crown-piece will represent the wooden pattern for the mould: it was full 6 feet diameter, and about 5½ inches thick. The bottom of the mould (the crown-piece) was now included in a quadrangular wood frame, and sand being rammed between it and the wooden pattern, the latter was removed with the crane; and the mould thus made, being so perfectly horizontal, was ready to receive the melted mass.

The metals of which the speculum is composed are copper and tin, 126 parts of the former to 57½ of the latter; had it been 58 of tin, the proportions would have been the atomic standard.

The copper employed was fragments of copper sheathing, and about 3 tons of it were used; the tin was grain-tin. The price of the former is about £100 a ton; that of the latter I do not know.

At 2 o'clock in the morning of Wednesday, the 13th April, the furnaces were lighted, and in about 10 hours the crucibles were in a state fit for receiving their respective charges.

The metal, which had been previously fused and broken up, was distributed equally amongst the crucibles, so that any accidental difference in it was probably destroyed.

By 9 in the evening, the furnaces were opened, and the flames of nearly homogeneous yellow light which issued from them were splendid. The countenances of the bystanders looked like those of ghosts, whilst the scarlet coats of the officers present seemed a dirty yellow.

Tackle from the crane was now fastened to one of the crucibles at the extremity of the chimney line, and when raised above its furnace, the revolution of the crane on its centre deposited it as quietly as possible in its corresponding iron basket; it did the same for the second crucible, and also for the third.

By turning the iron baskets on their pivots, the contents of the crucibles were simultaneously poured into the mould, and some minutes elapsed before the undulatory motion of the fluid metal ceased.

In about 20 minutes, the quadrangular wooden frame and sand were removed; an iron ring connected with a bar passing through the oven at the back aperture was clamped round the red-hot speculum, the tackle of a capstan was hooked to the bar, and the speculum was hauled from the bottom of the mould over an iron railway into the annealing oven. The oven, whose interior had been kept at a dull red heat for some days, was now charged with charcoal, the arches below with turf, and every opening of the oven built up and plastered over, and it is supposed that two months will elapse before the speculum is cool enough to be removed with safety *.

Not an accident or anything untoward happened during the process; and in 40 minutes from the time of the first crucible being moved, the speculum was safely in the oven.

The metal is 6 feet diameter; it is 5½ inches thick at the edges, and 5 inches at the centre; its weight is about 3 tons.

By grinding and polishing, its thickness will probably be reduced 1-10th or 1-8th of an inch—it will be formed into a telescope of 50 feet focal length, and will, there is every reason to hope, be actually in use this year.

The speculum will have a reflecting surface of 4,071 square inches; whilst that of the telescope made by the immortal Herschel, under the auspices of King George III., had but 1,811. J. South.

Observatory, Kensington.

P.S. The foundry is not many feet from Birr Castle, the residence in Ireland of the Earl of Rosse; and, with the exception of the crucibles, which were made by Messrs. Dewer, of Old-street, St. Luke's, all the apparatus employed on this interesting occasion, (the steam-engine itself included,) was made in workshops adjoining the Castle, under the Earl's immediate directions, by workmen trained and instructed by himself."

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* The speculum was not, however, removed until it had lain in the oven nearly sixteen weeks.

DUCTILITY OF GLASS.

The Conservator of the Museum of Avignon has remarked, that all the glass vases found buried at Vaison, were so soft and ductile, when first discovered, that they might be kneaded up and cut with a knife-blade; but that they assumed the fragility and hardness of common glass, after a few hours' exposure to the air This remark applied only to the vases buried at a depth of at least three metres.—*Athenæum*, No. 769

PLATE-GLASS MACHINERY.

Mr Bessemer has patented certain improvements, which the Editor of the *Mechanics' Magazine* regards as "of more importance than any which have been introduced into the Glass Manufacture for a long series of years They relate principally to plate-glass and optical flint-glass" (See No 990 *Mechanics' Magazine* for the details, amply illustrated with woodcuts)

The claim of the Patentee is as follows —

First to the forming of furnaces of solid masonry in the centre and with separate chambers and fire-places arranged round that solid centre, so that each cistern or pot may be heated independently of its neighbouring cistern or pot, and withdrawn from the furnace to be emptied of its contents, when the glass contained therein is in a fit state for being operated upon, without affecting the temperature of the other pots or cisterns in the furnace , as also the conical-shaped covers placed over each separate furnace, and glazed inside to prevent the falling of tears into the melted glass. Second the introduction of a platinum bottom to the cistern or pot, and the application of a top ring thereto , and the perforated ring on which the cistern or pot rests. Third the mode of skimming by means of the top ring and handled cutting plate Fourth placing the cistern or pot in a vacuum, in order to exhaust the air from the glass contained therein, previous to its being poured upon the table Fifth the annealing table, (the various parts of which the patentee prefers to be of fire-brick, but which may be made of stone of any suitable kind to stand great heat,) united together so as to form one solid mass, and ground or otherwise brought to a perfectly level surface.

VAST SHEET OF PLATE-GLASS.

The largest Plate of Glass yet cast has been finished by the Thames Plate Glass Company, at Poplar. Its dimensions are 14 ft. 8 in long by 8½ ft. wide.

GLASS DAMASK.

Mr L. Schwabe has detailed to the British Association the formation of artificial Threads of Glass, for the manufacture of ornamental Damasks Of the various kinds of glass, that best adapted for the purpose is common window-glass , and the samples exhibited to the meeting by Mr Schwabe were made from the broken windows of his own establishment. It is worthy of remark, that the minute fibres of glass are always of the same shape as the bar of glass from which they are drawn. If that be round, the thread is round; if square or flat, the form of the thread varies accordingly, and as a flat thread reflects the light better, and consequently, appears more lustrous than a round one, the best form is a narrow flat slip, such as window-glass readily produces Mr Schwabe showed the apparatus used, and the process of spinning the exceedingly minute threads, of which from one to two hundred are used to form a single shoot of the weft

DRY TILE-MAKING

Messrs Minton and Co, of Stoke-upon-Trent, have invented a mode of making Tesselated Tiles, and other objects, by the compression of dry powder of clay The advantage of the invention is the perfect truth of the tiles When formed of wet clay, they almost invariably warp, and become crooked By the above mode, a mould is filled with the dry powdered clay, which is subjected to heavy pressure, and thus caused to cohere sufficiently to bear being placed in the kiln, where it is burned in the usual manner Messrs Minton also make tesselated and roofing tiles of a new construction, much lighter than ordinary tiles and by which the capillary action of water, under the edges of the tiles, is prevented

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PATENT TILE MACHINE

Mr W. Irving has patented a Machine for the manufacture of draining and other Tiles and Bricks, of extreme simplicity and cheapness in its construction and working The machine is so portable that one man can carry it, and it needs no fixing The Patentee states that by the labour of one man and three boys, 5000 tiles per day can be made with ease, at a cost of less than 2s per 1000. At one operation, 16 tiles are made, which an experienced hand would accomplish in one minute, equal to 9,600 per day of 10 hours For Engravings of this machine, see *Civil Engineer and Architect's Journal*, No 52, p 8, No 53, p 61

NEW MODE OF CONSTRUCTING WINDMILLS

On March 21, M Durand detailed to the Academy of Sciences, at Paris, a New Mode of Constructing Windmills, by chiefly imparting to the sails of the mill their impelling force in a way resembling that which is experienced in the mode of sailing a vessel. The action of the wind striking from behind, bears upon a point beyond the centre of the pivot, and tends to keep the shaft in a parallel direction with the current of air, the sails being constantly maintained at a right angle with the wind. By this new system, the sails, six in number, are not, like those of the common mills in use, supported upon frame-work, but are attached and spread in the same manner as those of a vessel. They are so disposed that their whole surfaces may be acted upon so long as the wind, augmented in effect by their whole surfaces, is inferior to the weight of a counterpoise, which tends constantly to keep it in its normal position. When the wind exceeds this limit, the counterpoise comes into action, and so changes the quantity of surface exposed, that the machinery may continue to perform its functions without any acceleration of motion beyond what is requisite. M. Durand states his invention to have been submitted to the test of experience; several mills so constructed having, for years past, been in operation, and effectually resisted the most violent storms.

MARSHALL'S FLAX-MILL, AT LEEDS.

ON May 10, Mr. Combe described to the Institution of Civil Engineers, a Flax-mill recently erected by Messrs. Marshall and Co. at Leeds. This mill consists of one room, 396 feet long by 216 feet wide, covering nearly two acres of ground. The roof is formed of brick-groined arches 21 feet high by 36 feet span, upon cast-iron pillars: an impermeable covering of coal-tar and lime is laid on a coating of rough plaster over the arches, and upon that is a layer of earth 8 inches thick, sown with grass. This immense room is lighted and ventilated by a series of skylights 13 feet 6 inches diameter; one at the centre of each arch. A vaulted cellar with brick pillars extends under the whole of the building, and contains the shafts for communicating the motion from a pair of engines of 100 horse power, to the machinery in the mill; the flues and steam cases for warming and ventilating; the revolving fan for urging the air into the room, with the gas and water pipes; and the remainder of the space, is appropriated for warehouses.

The heating and ventilating are effected by a large fan, which forces the air through the pipes of two steam chests, each 10 feet long, and containing together 364 pipes of 3¼ inches bore: the temperature can be regulated by the quantity of steam which is admitted into the chests, or by allowing a portion of cold air to pass by without traversing the pipes: valves and doors in the flues permit any temperature which is desired to be obtained, or that degree of moisture which is essential for some part of the process of working flax.

The general details of the construction of the building are given, with the dimensions of the brick and stone work; the cast-iron pillars and caps, the wrought-iron tie-bars, with the reasons for adding a second set after the accident occurred to the first set; the mode of drainage from the roof; and the striking the centre of the arches, &c.

The total cost of the mill, including the ornamental stone front, was £27,443, which is stated to be about the same cost as that of a good fire-proof mill on the common plan; but as this mode of construction is novel to the workmen, it is probable that a second building of the kind would be less expensive.

The advantages resulting from the plan are, convenience of supervision, facility of access to the machines, the power of sustaining uniformity of temperature and moisture, the absence of currents of air, which are so objectionable in other mills, the simplicity of the driving gear, and the excellent ventilation, which is so desirable for the health of the workpeople.

IMPROVED BEE-HIVE.

We find described in the *Franklin Journal*, and quoted in the *Mechanics' Magazine*, No. 1001, the following patented improvement in that kind of Hive in which the honey is formed in glasses, and by which the patentee (Mr. James Le Pataurel,) says he is "enabled to take out the honey, &c., from the hive, without destroying the bees, and without running any risk of being injured by them." The glasses are made with a stem, which fits a hole in the cover of the hive, and are provided with a hole at top; and they are arranged in pairs, at a suitable distance apart, to receive two pipes that branch out from a furnace for generating smoke. To drive the bees from a set of glasses into the apartment below, the pipes are applied to the glasses; and a composition, consisting of 3 oz. of sulphur, 4 oz. of pitch or tar, 1⅛ oz. of tobacco, and ¼ oz. of grease, is put into the furnace, which generates a smoke that expels the bees. The glasses are then removed, and the holes closed by means of moveable covers. To drive the bees from one apartment to another, the pipes of the furnace are introduced through the holes in the cover of that apartment from which they are to be driven.

PATENT IRON MASON.

A machine under this name has been invented at Woodside, Glasgow. The stones go into the machine rough as they come from the quarrymen's pick, and come out polished ashlar on the surface, and cut parallel and square on the sides, fully prepared for the builder; and this at an expense of not more than a fourth of work done by hand. The machine has been constructed by Messrs. P. W. M'Onie and Co., engineers, Scotland Street, Tradeston, the design and arrangements being the work of Mr. P. M'Onie, of that firm. The machine, with the experimenting and patents, has cost £1,000; although new machines of the same size can now be made for one-third of that sum, and smaller ones proportionably cheaper.—*Glasgow Practical Mechanic.*

GRANITE STATUE.

Mr. Campbell, the distinguished sculptor, of London, has completed a colossal Statue of the late Duke of Gordon. It is of Aberdeen granite, 10 feet in height, and is to be placed upon a pedestal of the same elevation, in some part of the city of Aberdeen. His Grace is represented in military costume, leaning on his sword, and with one foot resting on a piece of ordnance; and around his shoulders is gracefully thrown a cloak. The likeness is singularly faithful, and the minutest detail is given with extraordinary freedom and truth. This is stated to be the first statue that has been executed in granite in modern times. The experiment was, of course, rather hazardous, but it has been completely successful; and it is referred to as "a singular instance of the triumph of genius and art over difficulties which, since the day of the Ptolemies, have been deemed insurmountable"—*Aberdeen Journal.*

STUCCO PAINT CEMENT

THIS Cement will be useful for damp situations, and for walls exposed to a south-western aspect in the country, or on the road side When laid upon plaster, wood, or slate, it has all the appearance of stone, and forms a completely impermeable coating, which serves both as paint and cement It is manufactured and sold in a fluid state, like white lead, and when used, it is mixed with sand, in the proportion of 3 of the latter to 1 of the former, and laid upon brickwork in the usual manner

ASPHALTE ROOFING

IT was remarked as a singular circumstance, during the late conflagration at Hamburg, that Roofs covered with Asphalte opposed rather than encouraged the progress of the flames It was imagined, on account of the substance of which these roofs were composed, that they would easily catch fire, whereas, when the roofs of the houses fell in, the asphalte, in which a sort of rubbish is mixed up, was found to have resisted the effects of heat, and, like a mass of dirt, to smother rather than encourage the flames

MARTIN'S PATENT CEMENT

THIS new composition, when laid on walls and mouldings, presents a surface nearly as smooth and hard as glass, and is applied much in the same way as any other cement Among its various applications are the following —

Floors are formed with the cement laid on a bed of concrete or arching to imitate Portland or Bath stone, the grit is mixed with the cement, it is then trowelled and jointed For ornamental floors colours are mixed (dry) with the cement, and the floor may be laid to represent octagonal tiles, or alternate squares in any colour or pattern inlaid borders, and mosaic in imitation of the Alhambra tiles, are also cast in slabs

Stairs are formed entirely of this cement, or the steps are in York stone, rough, and covered with the cement to imitate Bath, Portland, or any other stone

Walls have the panels worked in the cement mixed with sand, and the mouldings run in the pure cement, and highly finished The great objection to panelled walls has hitherto been their very heavy expense

Architraves, surbases, skirtings, and every description of moulding, can be worked in this cement it presents a fine face and clearer aris than wood, requires less paint, neither shrinks nor cracks, is not so liable to injury, and is of economical cost Chimney-pieces, columns, pilasters, &c can be executed in this cement with polish and splendour equal to scagliola in imitation of any marble.

It is as easy to remove as marble, and is as readily repaired when injured.

From this high recommendation, (abridged from the *Civil Engineer and Architect's Journal*, No. 61,) we should consider Martin's Cement a successful aid to decorative art.

JEFFERY'S ADHESIVE COMPOSITION.

THIS compound is proposed for use in place of the substance with which vessels are at present caulked, to render them water-tight; and the experiments made with it by a committee of master shipwrights at Woolwich have been satisfactory. Two pieces of African teak, a species of wood difficult to be joined together by glue, on account of its oily nature, had a coating of the composition applied to them in its boiling state; and shortly afterwards, bolts and screws were attached to each end, the joined wood placed in the testing frame, and the power of a Bramah's hydraulic engine applied to the extent of 19 tons, when the chain broke without the slightest strain being susceptible where the joining took place. A large chain, of one inch and a half in diameter, was then applied: it broke with a strain of 21 tons, the joint in the wood remaining apparently as firm as at first. The utmost strain the cement can bear in this form, therefore, remains to be proved when experiments are made with larger chains. Four pieces of hard wood were then joined together, weighing in one piece 44 cwt., and carried to the top of the shears in the dockyard, a height of 76 feet, from which it was precipitated on the hard granite wharf wall below, without any of the joints yielding in the smallest degree. Experiments were next made with it, by bringing the full force of cannon balls against it. A number of planks of oak 6 inches thick and fir 16 inches square, were joined together with the cement, to represent eight feet in height and eight feet in length of the side of a first-rate ship-of-war, without any thing else in the shape of bolt or security to assist the composition: and it was set up as a target. Three new 32-pounder guns were placed at 400 yards distance or point blank range, and three shots fired. The effects were wonderful, tearing the wood to pieces; and, in only one instance, where the joint had not been good, showing that they had any effect upon the cement, so as to separate the joined parts from each other. A hole six inches and a quarter in diameter was then bored in the centre of the target, and a 32-pounder shell inserted, and exploded by a match, which tore the wood to small splinters without in many places in the least separating the composition. This new invention is said to possess the power of expanding like India-rubber in warm climates, and will not become brittle under the coldest temperature.—*Times.*

The above Cement has been subsequently stated (in the *Mechanics' Magazine*) to consist simply of shell lac and caoutchouc dissolved in naphtha in certain proportions. The cost is about half that of common glue.

CARPET TAPESTRY.

Professor Vignoles has exhibited to the British Association some specimens of his newly-invented Carpet Tapestry. He explained that these works were made on the principle of the ancient mosaics, being composed of innumerable transverse sections of woollen threads. No painting, no colouring, was used; all the effect was produced by ends of worsted about ⅛ of an inch long standing vertically, one end being seen, and the other cemented by India-rubber to a cloth. The exact operation was yet a secret, but he believed that two frames of fine wire or perforated zinc (some with even 4,000 perforations in an inch,) were placed over each other exactly vertically, the distance being only regulated by the height of the room; in the present instance he believed about five feet. The picture to be copied being then traced on the top side of the upper frame, a workman passed threads of dyed wool through the corresponding holes in the top and bottom frames; of course, as in tapestry, varying his shades and colours until he is satisfied with the effect: this he can judge of by looking down on the upper ends of the threads, although to a person looking at the space between the frames, there seems only a confused and compact mass of worsted. When the workman is satisfied, the upper ends of the threads are covered with India-rubber cement, and a cloth is laid upon them also covered with cement; the ends of the threads firmly adhere to this cloth. By means of a sharp cutting instrument, the entire mass of threads is now cut through transversely at about ⅛ of an inch from the cloth, and this process being repeated, a fresh copy is obtained from every ⅛ of an inch: in the present frames, being five feet apart, 480 copies can be cut; and as there is no limit to the distance, except the height of the apartment, thousands of copies may be taken of each. Were this not the case, the invention, however ingenious, would be too expensive to be purchased except in solitary instances as specimens of curious art: but, from the facility of reproduction, this fabric was likely to come into general use for carpets, rugs, curtains, table and chair covers, &c.: for carpets and rugs it could be made with a longer nap, so as to give any degree of substance.—*Athenæum*, No. 768.

The above beautiful fabrics are claimed to have been first noticed in the *Literary Gazette*, No. 1320, p. 314.

SPITALFIELDS PORTRAIT-WEAVING.

A Portrait of H. R. H. the Duchess of Kent has been woven in Spitalfields by J. R. Kettle, 48, Pearson-street. It is copied from the well-known print of Her Royal Highness, by Cochran, and its details have been followed with astonishing minuteness. The effect of the hat and plume is admirable; the ermine and folds of the mantilla which envelope the figure are shadowed with a softness true to nature; while the minor points of the picture are worked out with extreme care and fidelity. In short, this product of the loom presents a perfect facsimile, even to the lettering and the autograph, of the original engraving. This is the first attempt of portrait-weaving in this country: it is about 14 inches by 10, exclusive of the lettering,

&c. It was woven with the Jacquard machine on an extensive scale, and it took nearly 4000 cards. The pattern drawing, card cutting, machinery, and material for weaving, have cost £100. The portrait has been presented to the Duchess of Kent.

NEW PROCESS OF DYEING.

THE *Commerce* announces that the Russian government have purchased for the sum of 1,000,000 rubles the new process of dyeing blue, by means of which the price of dyeing a piece of cloth is reduced to six francs from thirty-two. M. Casimir Pérrier, the French Minister at St. Petersburgh, has been in treaty with the inventor for the acquisition of his discovery, which would "free France from the tribute which she pays yearly to both Indies for indigo."

PATENT RELIEVO LEATHER HANGINGS.

THE improvements in interior decoration are fast multiplying: and foremost amongst them may be noticed the advances made in Messrs. Leake's Patent Relievo Leather Hangings, panels, imitative oak carvings, &c. The designs are very beautiful; indeed, it is difficult to discover that some of the patterns are not carvings in wood—so closely imitated are the chisel marks, the grain of the wood, the undercutting, and its assimilation of colour, to the best oak and walnut carving of the Middle Ages. The hangings, friezes, heads, fruits, &c. in the various rich and elaborate styles of decoration prevalent in Spain, Italy, France, and Germany, as well as our own "Elizabethan," are here deceptively imitated. The cost of these ornaments is about half the price of carvings in wood; and this invention must aid in improving our present mode of decorating public buildings, the baronial residences of our nobility, churches, &c.—*Civil Engin. and Arch. Journal*, No. 61.

NEW PAPER-HANGING.

A NEW style of Paper-hanging has recently been introduced at Liverpool from Switzerland. The character of the design is Florentine; the groundwork is white satin; the walls are divided into compartments, by rich gold-coloured stiles, representing intricate carving; the panels are niches with drawings of deer, lions, swans, &c., each forming a complete picture in gorgeous gold borders, somewhat in the Louis Quatorze style; the alternate panels are filled with filagree work, interspersed with flowers and gems; and altogether of exquisite design and execution. An exceedingly rich border runs round the top and bottom of the room. From the judicious employment of French greys and other cool colours, the effect is not gaudy, but at once rich and chaste.—*Quoted from a Liverpool newspaper, in the Mechanics' Magazine*, No. 1002; *abd.*

TO IMITATE FANCY WOODS.

MR. T. W. NAYLOR, of Newcastle-upon-Tyne, has communicated to the *Mechanics' Magazine*, No. 987, the following method, invented by him, of improving the appearance of most common Woods, as plane, birch, &c., so that they may be employed in veneering and beautifying the most costly cabinet-work, &c.

The wood is first sawn into sheets or slips of about one-eighth of an inch in thickness: this done, they must be pressed between two warm metal plates, having corresponding grooves cast on the surface, resembling waves, (and fitting accurately when placed together), the sheets of wood must be kept between them until they have properly set and become firm, when they may be taken out, and after the inequalities have been planed off and made smooth, the texture and appearance will be precisely that observed in the most beautifullly figured maple.

IMITATIVE CARVING.

On March 9, was explained to the Institution of Civil Engineers, Messrs. Braithwaite's patent process for imitating Wood Carving by burning Mr. E. Solly, jun. stated the object of the new process to be simply to save time and labour, and thereby diminish expense. In place of cutting away the wood desired to be removed, Messrs Braithwaite employ heated metal moulds, exactly corresponding to the wood intended to be removed, these being pressed against the surface of the wood, char it at the points where they come in contact with it. This operation is repeated several times, the charcoal formed being brushed away between each application of the heated mould, and thus, in a short time, all the wood which, in the old process of carving by hand, would have been removed by the knife, is burned or charred, and brushed away, whilst the pattern, which was of course sunk in the metal mould, stands up in bold relief It is essential in this process that the heated mould be rapidly, steadily, and forcibly pressed into the wood, and very ingenious mechanical arrangements are required to effect this. It is also of the first importance to take care that the wood does not inflame, it must be charred, but not burnt, as, if suffered to burn or catch fire, the heat would spread, and the wood would be unequally charred. In order to ensure this, the wood is always wetted before being pressed into the heated iron mould this prevents inflammation, and facilitates the subsequent removal of the charred wood. The strength of the wood is not at all impaired by the operations.

NEW MODE OF ORNAMENTING FANCY CUTLERY.

Mr. M. T. Brazendale, of Newcastle, has communicated to the *Mechanics' Magazine*, No. 973, a new mode for ornamenting Sword-blades and fancy Cutlery, by applying *printed impressions* to the surface of the articles, and afterwards immersing them in the usual acid liquor. Sword-blades, knives, steel snuffers, and scissors—in fact, every description of fancy hardware goods in steel—can be thus beautifully ornamented, with expedition and cheapness. The plates from which the impressions are taken may be like those used by pot-painters for porcelain; but the ink should be composed of about equal parts of common asphaltum and bees'-wax, laid on hot, and printed at the rolling-press. Perhaps, wood engravings might be employed for the same purpose; in which case, they should be printed at the typographic press, with an ink composed of asphaltum varnish mixed with a little bees'-wax. In both cases, the goods ought to be warmed a little when the impression is transferred thereto, so as to cause the ink to adhere.

SHOEING HORSES.

A PATENT has been taken out in France, for shoeing horses by simple adhesion. The foot of the animal once prepared for the new method, may be afterwards shod and unshod at pleasure by the groom.

BROCKEDON'S CAOUTCHOUC STOPPERS FOR BOTTLES.

MR. BROCKEDON has exhibited to the British Association specimens of his patent India-rubber Stoppers for Bottles, explaining the late improvement in the construction of the cores on which the India-rubber is spread. The present cores, he said, were made of cotton twisted into strands, &c., by means of a machine which he explained by a diagram. The cylindrical rope now consisted of several strands of tightly twisted cotton, lapped with flax thread, and laid together longitudinally, loose fine cotton rovings being placed between them; the entire was then lapped in a cylindrical form with flax thread, attaining by this method the advantages of perfect roundness and firmness; they also gave sufficient hold to the corkscrew, and bore the heating process well. These stoppers would slide on glass when wet, but not when dry, (although there was no cohesion in this latter state); so that the bottler, by slightly wetting these stoppers with the liquor which he was bottling, could easily insert them; and when this slight film of moisture was dried up, the stopper required considerable force to withdraw it.

NEW MODE OF PRESERVING PAINT.

ON March 23, was explained to the Society of Arts the use of Mr. Rand's Collapsible Metallic Tubes for preserving Paint and other fluids. If paint be kept in bladders, when once opened, the air gets in, and first the surface and afterwards the whole mass hardens. A better method is that of Mr. Harrison, which was laid before the Society some years ago, and consists of a syringe of brass or other metal lined with tin. These syringes have been extensively used, and are very durable; but they require great care in making, and are expensive. *Mr. Rand employs flexible drawn tubes of block tin, of about half an inch in diameter, and from three to six inches long;* one end is furnished with a stopper, and the other closed with pincers. The paint is squeezed out by taking out the stopper and pressing the tube together, commencing at the flattened end. The price of the tubes is trifling, and the old ones may be melted down and re-made. The metallic tubes are also applied to preserving provisions, and are made of various sizes for butter, portable soup, and concentrated essences, from which, with the assistance of a jug of hot water, Mr. Rand, in a few seconds, produced some cups of tea and coffee.—*Athenæum*, No. 753.

IMPROVED DOOR KNOBS.

MR. D. GREENFIELD, of Birmingham, has patented certain improvements in manufacturing hollow metal Knobs for the handles of door and other locks; in which an interior lining of stamped iron-plate is formed to the hollow ball-part of the knob, and, if requisite, an interior of cast-iron to the neck part, so as to give greater support to the entire knob.

SUGAR FROM FIGS.

GENERAL LAMORICIERE has discovered, in Algeria, that a pound of Sugar can be produced from common Figs at the rate of four sous per lb. It is only requisite to divide the fruit in two, expose it to the rays of the sun, and then take off the efflorescent sugar with a soft brush. The Governor-General of Algeria has given orders to the colonists extensively to plant the Barbary fig-tree; which will be of easy execution; the vegetation being possible in the most arid ground. The sugar of this fig is identical with that of the sugar-cane, being purely crystallisable.

SUGAR FROM CORN.

A NEW mode of raising Corn trebles the saccharine quality of the stalk, and with attention it is confidently expected that 1,000 lbs. of Sugar per acre may be obtained. Complete success has attended the experiments on this subject in Delaware, which leave no room to doubt the fact that if the stalk is permitted to mature, without suffering the ear to form, the saccharine matter, (three times as great as in beets, and equal to cane), will amply repay the cost of manufacture into sugar.—*Report to Congress of the American Commissioner of Patents*.

THE PATENT IMPILIA SHOE.

THIS invention is highly conducive to personal comfort. Its properties are to keep the feet warm and dry; to give ease in walking, to prevent the formation of corns, and to cause the disappearance of those already contracted; and to prevent creaking. The soles of these shoes are so constructed as to impart a sensation, while walking on the hardest path or pavement, like that of treading upon carpet. They wear longer than the common shoe, and retain their proper shape to the end; for by the yielding quality of the sole, the foot is allowed to sink as upon a mattrass; thus preventing any extension of the upper leather from side pressure. They likewise possess the advantage over waterproof boots or shoes, of allowing perspiration to pass off, without, (so long as the outermost sole remains whole), suffering the damp to penetrate to the feet.

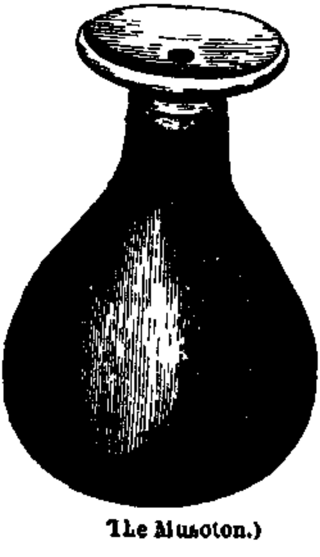
In the specification of the Patentee, (Mr. W. Baker, surgeon, of Grosvenor-street,) the invention is stated to consist in a layer of horse or other strong curled hair, (felted or matted together, with or without a layer of caoutchouc), between the inner and outer soles of shoes and boots. When a sole is to be composed of more than two thicknesses of leather, the Patentee prefers that the layer of felted or matted hair should lie between the two upper pieces of leather. In some cases, in addition to the use of a layer of matted or felted hair, he applies a thin sheet of India-rubber, (caoutchouc), on the under surface of the matted hair, either by applying the solution of India-rubber thereto, or by placing a thin sheet of India-rubber on the under surface of the matted or felted hair.

The Impilia boots and shoes are warmly recommended in letters from Drs. Paris, Roots, and Hodgkin, and other eminent medical men.

WATER SHOES.

Lieut. Hookenberg, of Denmark, has invented an apparatus, by means of which persons may traverse the water. It is described as "resembling two very narrow boats, pointed at both ends, and united by a square piece of wood, about thirty inches long." The following account of a recent exhibition of it is given in the *United Service Journal*. "The arm of the sea which runs into the Thier Garter was the spot selected for the evolutions. The water-runners went through a variety of movements, among which were their loading and discharging their muskets while upon the water, running along on its surface at full speed," &c. These shoes, it is added, are so easy, that any person of moderate dexterity and quickness may be taught to manage them.—*Mechanics' Magazine*, No. 962.

THE MUSOTON.


The Musoton.)

Cases are sometimes met with, in which, from the improper use of acoustic instruments, or from a sudden and very loud noise, the *membrana tympani* is rendered concavo-convex in an improper sense. To remedy this, Mr. J. H. Curtis, the aurist, has constructed an instrument consisting of a bag of caoutchouc, with a large ivory bowl attached to it and pierced in its centre, with an aperture communicating with the interior of the caoutchouc bag, to which he has given the name of *the Musoton*. By emptying the bag of air, and then applying the bowl over the ear, such a force is exerted by it, on the air being again introduced, that the membrane is drawn out and restored to its natural condition. The bowl is connected to the caoutchouc bag by a long ivory nipple on its surface, on which the caoutchouc is securely fastened. When applied over the ear, it is perfectly air-tight, the ivory bowl being cut expressly to fit the shape of the parts circumjacent to the auricle. The instrument is also very efficient in dry cupping, and from its simplicity it is likely to prove very useful and convenient.—*Mechanics' Magazine*, No. 965.

CYMAGRAPH FOR COPYING MOULDINGS.

THE purpose for which this instrument has been constructed, (by Prof Willis,) is to obtain exact drawings of the profiles of existing mouldings. The importance of doing this is well known; but the methods hitherto employed appeared to Prof. Willis susceptible of improvement The oldest and most usual is to measure a sufficient number of ordinates and their distances, and thus to lay down the mouldings by points. When the exact form is required, lead tape has been employed, or clay , but the best method is to lay the bed of the stone upon which the mouldings are carved upon the paper, and trace the outline; or else to make a saw cut transverse to the mouldings, (or through a joint,) and introduce paper into this cut, upon which the section of the moulding may be traced But these latter plans, excellent as they are, can only be employed in dealing with ruins, neglected buildings, or buildings under repair

A few years ago, Prof Willis contrived an instrument which consisted of little more than the stylus of the present one , but he found it too troublesome to use with the necessary precision, and yet so useful, that he has fitted up a more complete and commodious machine, to which he applies the name of Cymagraph An illustrated description of the instrument will be found in the *Civil Engineer and Architects' Journal*, No 58 when folded up, it is 5¼ by 11⅛ in and 1½ in thick, and may be carried in a carpet bag without injury. The principal piece of the machine is the stylus mounted in a frame or carriage, to which is fixed a pencil. "If, then, the carriage with its stylus be moved parallel to itself over the surface of a drawing-board, it is clear that any given point of the carriage will describe precisely the same path as the point of the stylus does, and since the pencil is attached to the carriage, this will also be true for it , so that if the tracing-point of the stylus be made to pass transversely across a series of mouldings, and the point be, at the same time, kept also in contact with their surface, the pencil will simultaneously describe upon the paper the exact form of the section of these mouldings of the same size as the original" For further details, the reader is referred to the paper and Journal above named.

ELLIPTIC COMPASSES.

A NEW Elliptic Compass has been brought forward in Paris by MM Hamman and Hempel it traces the *whole* curve, and is founded on the genesis of the curve by the motion of a point which turns round a second, which, in its turn, revolves with a velocity (*sous-double*) round a fixed point.—*Mechanics' Magazine*, No. 975.

A NEW DRAWING-PAPER

Has been recommended to surveyors, by the British Association. Its chief advantages are expansion and contraction with regularity, and, by the method of joining the sheets, it always presents a smooth surface The paper itself is an union of ordinary drawing paper with cloth by a new cement

THE SKETCHER'S GUIDE.

This is an apparatus to assist persons unacquainted with the art of drawing The principle is to trace with prepared chalk on a glass, crossed by longitudinal and transverse lines, the objects seen through it, and then to lay a paper on the glass, hold them up to the light, and retrace from the glass on to the paper The first process is simple and easy enough, but the second is more difficult, and might be improved by preparing a paper for the purpose thinner than usual, and so constructing an inner frame that it should confine and press the paper on to the glass.

SOLUTION OF CAOUTCHOUC FOR ARTISTS

M Vallé, a colour-maker, employs a Solution of Caoutchouc for preparing canvas used by painters, which he considers will prevent the injurious influence of the atmosphere upon the surface, such as is often seen in the works of some of the greatest masters Although applied to both sides of the canvas, it leaves it sufficiently elastic to prevent cracking, and secure it from the action of the atmosphere.

MINIATURES ON MARBLE.

Thin polished plates of white Marble are now strongly recommended, by several French artists, as a substitute for ivory, in Miniature-painting The slices of marble are cemented down upon a sheet of board-paper, to prevent danger of fracture they are said to take the colour with great freedom, and to hold it with tenacity, and it is obvious that they are incapable of change by time, or the effects of heat or damp Ivory, it is well known, becomes yellow, and in hot climates often splits or warps It can only be obtained, also, of a very limited size, whereas, these plates of the finest grained statuary marble can be obtained of any size. Plates of about 12 inches by 10 inches are prepared of only about three-sixteenths of an inch thick, and smaller ones thinner in proportion Marble has been occasionally used, before now, as a plane for painting on *in oils*, but its application to miniature-painting is certainly new, and seems valuable —*Repertory of Patent Inventions*

INLAID MARBLES

A **beautiful** mode of ornamenting Marbles has recently been brought into use in Paris —It consists in etching, by acids, deeply into the marble, various designs upon a properly prepared bituminous ground. When the corrosion has gone sufficiently deep, the cavities are filled up with hard coloured wax, prepared so as to take a polish equal to that of the marble when cleared off. Drawings thus made on black marble, and filled in with scarlet wax, after the manner of Etruscan, and certain Egyptian designs, are said to have a very noble effect, and are applied to tables, paneling, stoves, &c.—*Repertory of Patent Inventions.*

"TRIBUTE TO THE MEMORY OF SIR CHRISTOPHER WREN."

In the *Civil Engineer and Architects' Journal,* No 61, will be found a key-plate reduced from Mr. Cockerell's design, illustrating all the principal works of Wren. This drawing contains no fewer than sixty public structures, admirably grouped together, so as to produce a beautiful picturesque effect; it attracted much attention when exhibited at the Royal Academy in 1838. Mr. Hill, of Edinburgh, has published an engraving of this design, "in the highest manner of line, on the important scale of 22½ by 16 inches high"—an enterprise entitled to this special mention, as forming "an abiding record of the labours of the most distinguished master in English architecture, and a work so immediately connected with the sympathies of Englishmen and of English architects, that we hope to see it in the studio of every member of the profession." The key-plate in the above Journal is accompanied by what is modestly termed "some account of Wren," and a chronological list of his works it extends nearly to seven quarto pages, and is very neatly compiled.

STEEPLE OF ST MARTIN'S CHURCH.

The Steeple of the fine church of St. Martin-in-the-Fields was struck by lightning last autumn, and was so extensively damaged as to render it necessary to be taken down, and rebuilt The contract was undertaken by Mr. Hemming, of Regent-street, for 1000*l.*, which included the taking down of the old steeple, and the building of the new one. The work was completed on the 10th of October. The ball and vane have been regilt, the latter is 6 ft. 8 in. high, and 5 ft. long —About forty-five feet of the steeple had to be removed, and have been restored The stones, with the exception of the damage sustained by the lightning, were very slightly decayed, though they had been exposed above 130 years. The side of the steeple facing the west was discovered to be less perfect than either of the other sides.

THE GREAT PYRAMID OF EGYPT.

Mr. Tite, F R S., states the original dimensions of the Great Pyramid, near Gizeh, to have been 764 square feet at the base, and 480 feet of perpendicular height; covering 43 acres, 1 rood, 22 perches of ground. It consumed 89,028,000 cubic feet of stone, and Mr. Tite adds that it could not now be built for less than thirty millions sterling! The joints of the large casing blocks of granite were so fine as to be scarcely perceptible, not thicker than paper, and the mortar was so adhesive, that the stones, in some cases, broke through their substance rather than give way at the jointing.—*Proc. Archit. Soc. March* 1.

MODEL OF ST. PETER'S.

A VERY extraordinary work of art, by Signor Andrea Gambassini, has recently been brought from Paris. It is a Model, on the grandest scale, of the great cathedral dedicated to St. Peter at Rome; and in beauty of design and minuteness of execution, this model transcends every other that has been seen in this country. Every arch, every gallery, every colonnade, nay, every picture and every statue, are produced; and could a human being dwarf himself to a corresponding size,—namely, one hundredth part of its dimensions, he might traverse every stair, and worship at every altar, without doubt of his presence in the giant structure of Rome. The statues, which are in ivory, and the paintings, which are on copper, are of no inconsiderable merit. By a very ingenious piece of mechanism, portions of the model are opened, the building is bisected, and the gorgeous interior, replete with choicest decorations, is thrown open for inspection. This wonderful work has occupied fourteen years of the life of the artist.

THE LEANING TOWER OF PISA.

WHEN at Pisa, Capt. Basil Hall investigated the origin of the divergence of the above Tower from the perpendicular, and established completely to his own satisfaction, that it had been built from top to bottom, originally, just as it now stands. His reasons for thinking so are, that the line of the tower, on that side towards which it leans, has not the same curvature as the line on the opposite, or what may be called the upper side. If the tower had been built upright, and then been made to incline over, the line of the wall on that side towards which the inclination was given, would be, more or less, concave in that direction; owing to the nodding, or "swagging over," of the top, by the simple action of gravity acting on a very tall mass of masonry, which is more or less elastic, when placed in a sloping position. But the contrary is the fact; for the line of wall on the side towards which the tower leans, is decidedly more convex than the opposite side. Capt. Hall has, therefore, no doubt whatever, that the architect, in raising his successive courses of stones, gained, or stole, a little at each layer, so as to render his work less and less overhanging as he went up; and thus, without betraying what he was about, really gained stability.—*Patchwork.*

NEW ROYAL STABLES, AT WINDSOR.

THESE extensive buildings have been completed according to the original designs of the late Sir Jeffrey Wyatville, under his successor, Mr. Ashton; the builders being Messrs. Peto and Grissell.

The buildings are in architectural keeping with Windsor castle, from which they are situate about 150 yards, southward; with a frontage of

300 feet to the Home Park. The stabling and coach-house department occupies three large quadrangles, divided from each other by high stone walls.

Accommodation is afforded, in the aggregate, for 102 horses, (exclusive of 13 loose boxes,) and 36 carriages.

The apartments in each quadrangle have water laid on, and are very complete in their appurtenances. The coach-houses are warmed by hot air; and an apparatus for heating water and warming is situated in the basement of each quadrangle.

The width of each stable, from the back of the manger to the opposite stall, is 22 feet. The Stables are admirably ventilated through an aperture leading to the roof, and are lit at night by gas. The flooring is of Dutch clinkers; in the centre of each stall are iron gratings, communicating with cross drains, which run into the heel drains, under the clinker flooring; and through these, by turning a tap, a strong course of water is forced, to clear every accumulation away from the under-drains into the common sewer to the river. The partitions of the stalls are of massive oak, highly polished. The fronts of the manger, and the walls at their backs, are of slate. The front upper edges of the manger consist of a revolving cast-iron roller, which will prevent crib-biting.

The new riding-school divides the upper or northern quadrangle from the centre one, and is 170 feet long, 52 feet wide, and nearly 40 feet high; and it may be lit by three splendid gas chandeliers: above are 30 dormitories.

The cost of the entire building has been brought within the amount of the Parliamentary grant of £70,000.

NEW MARINE INSTRUMENTS.*

SATISFACTORY experiments have been made on board the *Lightning* steam-vessel, with Mr. Clement's Sillometer, and Marine and Steam Thermometers. The experiments commenced a short distance below Gravesend, and after a run of about 2½ hours, Massey's log, with which the sillometer was compared, showed the distance run to be 15 1-10 miles—the sillometer exactly 15 miles. An experiment was made by altering the course of the vessel several miles, and the sillometer indicated that during the operation the speed had decreased from 8 to 7 miles per hour. On the passage outward, the steam was let off, to ascertain the effect on the sillometer, which indicated a gradual reduction of speed from 8 to 4 miles per hour; and on the vessel resuming full speed, it indicated the actual progress of 8 miles per hour.

Experiments were also made by moving the whole of the vessel's company and guns backward and forward, and turning her in various ways, when the sillometer, by its dials on the deck, appeared to indicate the number of miles sailed exactly as denoted by the common log.

One important advantage of this invention is—a whole fleet might start from a given point, and sail during the darkest night, or through the thickest fog, and be certain of being near each other at any given time, by agreeing to a certain speed of sailing, and uniform course by the compasses.

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* Described in the Year-Book of Facts, 1842, p. 41.

The experiments with the Marine Thermometer are stated to have indicated, with great precision, the depth of the water over which the vessel sailed, both in the open sea and on the Medway, where the trials were made. The Steam Thermometer appears to have indicated very satisfactorily the temperature of the steam as it was used, and the least variation—thus rendering it peculiarly applicable and valuable to vessels fitted with high-pressure engines.—*Times, October* 22.

LOGAN ROCK REPLACED.

This great "lion of the west," after being kept for the last several years, by means of chains and props, from falling off the rock on which it stood, is once more brought back to its former position. It appears that it had been gradually wearing away the part on which it stood, until it had become a foot distant from its own basis. By the ingenious adaptation of four screws, however, invented by James Tregurtha and J. Hutchens, of the village of Treene, they succeeded in forcing back the rock to its original place, and it may now be moved with greater facility than before, and with equal safety.—*Cornwall Gazette.*

THE CHINESE COLLECTION.

This vast assemblage of "Ten Thousand Chinese Things" is exhibited in St. George's Place, Hyde Park Corner. It has been formed by Mr. Dunn, an American gentleman, during a residence of eleven years in China, and has been exhibited to many admiring thousands in Philadelphia; and "to the unique character of the Collection, *i. e.* as *a whole*, we are anxious to point the reader's attention, presenting, as it does, a perfect picture of the genius, government, history, literature, agriculture, arts, trades, manners, customs, and social life, of the people of the Celestial Empire."

The main feature of the Exhibition is a series of groups of figures, natural size, representing the domestic life of China. Thus, we have a temple of idols, a council of mandarins; and Chinese priests, soldiers, men of letters, ladies of rank, tragedians, barbers, shoemakers, blacksmiths, boatwomen, servants, &c.—in short, from the pavilion of high life, to the shop of the middle classes. These groups are very effective, with the accessories, not of painted scenes, but of actual articles of furniture, &c.

The visitor will be struck with a two-story house, of the same size as seen in the streets of Canton; the lower part being fitted up and stocked as a retail china-shop, and affording a very correct representation of a similar establishment in China. Next is a silk-mercer's shop, as seen in the streets of Canton, completely furnished; this being *more life-like than any thing else in the collection.*

The models and drawings of boats are very attractive. Canton, with its 40,000 dwelling-houses, eclipses London and the Thames; and the dexterity of the Chinese in managing these boats, entitles them to rank as the best fresh-water sailors in the world.

The costumes are sumptuously wrought, and more to be admired for the patterns and richness of the material than their forms. In embroidery, the Chinese are, perhaps, unrivalled; and the elaborate designs on their China-ware prove them to possess considerable knowledge of the powers of combination of forms; their acquaintance with perspective, light, and shade, being another matter. A glass-case filled with shoes, for little and large feet, will excite much curiosity. Various patterns of silks, of most brilliant colours, remind us that the Chinese not only keep the best tea, but the finest-coloured silks, for themselves. But there are specimens of all the domestic arts and manufactures, too numerous for notice here: the Chinese carpenters' tools, by the way, differ from those of our own operatives more in rudeness than in actual form and mode of use; in which respect they resemble those of the Egyptians. The furniture, too, is mostly of graceful form.

The China-ware is very *recherché;* but is more interesting for its explanation of the uses of certain vessels than for novelty of material or embellishment.

The specimens in natural history are well arranged: the flowers, birds, and insects, are very superb; the shells and minerals of brilliant and many-hued varieties. The modes of cultivating tea, silk, and rice, are pictorially shown.

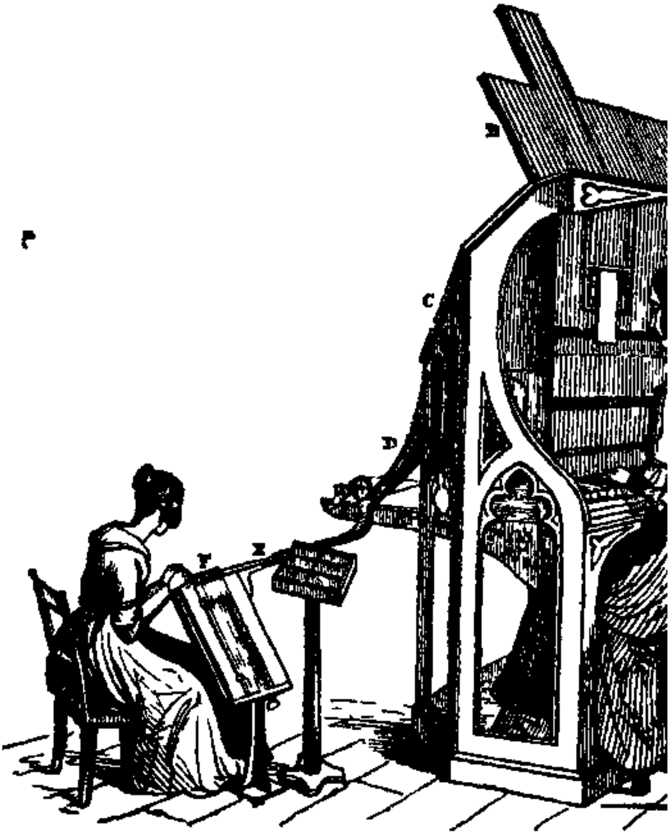
One of the cases contains, *inter alia,* a beautiful long tea-service of red lacquered or japanned ware; the fine varnish used as lacquer, distils, like a gum, from a shrub, and more than fifty coats of it are sometimes put on the ware. Another article in this case is especially worthy of notice, as its properties have posed the *savans* of our country. This is an ancient Metallic Mirror, such as was used in China prior to the introduction of glass. "The back is here presented to the visitor, being ornamented with numerous hieroglyphical figures. The opposite side is highly polished. In many mirrors of this description is a property that has puzzled the wise. Holding the mirror in the hand, by a knob in the centre of the back, and reflecting the rays of the sun from the polished surface, the exact representation of the raised figures on the back of the mirror are distinctly reflected on a wall, or other level surface. The probable solution of this difficulty is, that the figures seen at the back being of a harder metal than the other plain parts, are inserted into the softer metal; and hence the figures produced in the rays of light form the imperceptible union of the two metals to the naked eye. In this way, the union of iron and steel, as in Sheffield cutlery, will explain the enigma familiarly."—*Catalogue.*

BOOK-SHELVES.

It has been ascertained that the length of the Book-shelves in the Library of the British Museum, which hold 260,000 volumes, is 42,240 feet, or 8 miles. The length of Shelves in the Library at Munich, containing 500,000 volumes, taking the same proportion, will be 15 miles and 2-5ths. The King's Library in Paris, of 650,000 volumes, must, by the same calculation, have not less than 20 miles of shelf.—*John Bull.*

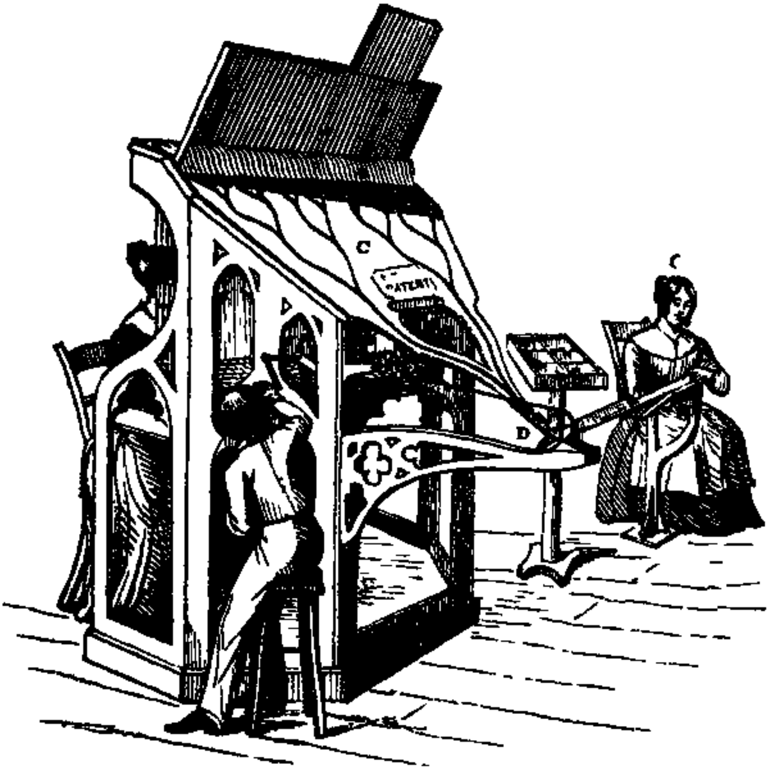
YOUNG AND DELCAMBRE'S PRINTERS' COMPOSING-MACHINE.

THIS apparatus is similar in principle to that brought out about a year and a half previously by the same parties, and described in the *Year-book of Facts*, 1842, p. 22. It has, however, been so simplified and improved in all its details, as to be, in effect, quite a new machine.



(Young and Delcambre's Printers' Composing Machine, Fig. 1.)

The accompanying Engravings represent the machine at work. Fig. 1 is a front view of it; fig. 2 a back view. It much resembles a cottage pianoforte divested of its case; and it has a set of keys, at which the compositor is seated. Of these keys there are as many as there are letters of the alphabet, and varieties of these letters likely to be required, with a due accompaniment of numerals, spaces, doubles, &c. Each key has one particular letter or character engraved upon it. Attached to these keys are an equal number of upright steel leaves, AA, which are connected at the top with a series of long brass channels, BB, filled with types, each of the sort corresponding with that marked on the key of the lever in connexion with it. The office of the lever is to abstract from the channel above one type every time it is acted on by the depression of the key; and to check the precipitating tendency of the types, which might interfere prejudicially with the action of the lever, the channels are placed in a position considerably inclined, and the lever made to act sidewise in detaching the lowest type of the column. Behind the channels, and at right angles with them, there is an inclined plane, C, which has a series of curved grooves cut out in its surface, corresponding and communicating with that of the channels—all leading to one general reservoir, or receiving spout, as it is called, at bottom, D; and all so nicely curved and graduated, in respect to one another, that work as fast as the compositor may, when a type is once liberated from its channel, and dispatched down one of these grooves, it is impossible, (except from some accidental circumstance,) for any subsequently liberated type to reach the goal before it.



(Young and Delcambre's Printers' Composing Machine, Fig. 2.)

The machine is set to work by two boys first filling the channels by setting up the types in wooden sticks, and transferring them. Th channels being thus filled, the lady-compositor begins with repeatin on the keys the letters of the manuscript before her; and, as she depresses the keys one after another, she sends corresponding letters down to the receiving spout—the action of the levers on the columns of types being so adjusted that only one type can be detached at a time. The spout is curved down toward its termination for about ten or twelve inches; and when the machine commences work, is filled with quadrats the whole length of such curve, which serve as a support for the letters to fall on, till a sufficient number of letters have accumulated to furnish an abutment for those which follow. Each type, as it reaches the termination of the straight part of the spout, is pressed forward by a small vibrating beater acted upon by an eccentric, which is put in motion by a small train of wheels driven by a boy (as shown in fig. 2.) From the spout, the types are passed forward along a horizontal brass rail, E, to the justifying box F, where they are placed in lines, and spaced out, or, as it is technically called, *justified*, by an assistant composer. This justifying-box answers, in every respect, to the ordinary composing-stick; and is used with equal, if not greater, facility. When the proper number of lines have been justified, they are taken out and placed in a galley, in the same way as a composing stick is usually emptied. With the subsequent processes of imposing, or arranging the set-up matter in chases for printing from, the present invention does not interfere.

After types have been printed from, the present practice is for the compositor to *distribute* them, that is, to return them to their original boxes in the case at which he stands; but with the machine, the task of distribution is performed by two boys; while two others, as before stated, are occupied in setting the types in lines, with which they fill the different channels.

Seven persons are required to work a machine, viz. one to play the keys, another to justify, a third to work the eccentric movement, two to supply the channels, and two to distribute; and it is herein, at first sight, that the machine suffers most in comparison with the ordinary mode of composition by a single hand. Of these seven persons, two are females, and five very young boys; and they can set up, after three months' practice only, 6000 types an hour, while a good compositor cannot ordinarily set up on an average more than 1700. The maker of the machine is Mr. J. G. Wilson, of Clerkenwell, and its cost about £100; in addition to which the Patentees propose to charge a small sum annually for license to use it.—*Selected and Abridged from the Mechanics' Magazine*, No. 985.

The Editor of the *Liverpool Albion* states, upon this invention:—"To show the working of the Machine, the Patentee gave the young woman who played the keys a column of copy from *The Albion* (newspaper), in what printers term Nonpareil type, such as an expert workman would set up in ten hours. The playing began shortly after two o'clock: at four, the whole quantity was composed, justified, and proved The proof was not free from literal errors, but had the young woman taken another quarter of an hour, she would have produced a proof comparatively free from errors Thus, the Machine composed in two hours a quantity of type, which only an expert workman could compose in ten hours The parties engaged in the process were two young women, one playing the keys, and the other justifying the lines, and two boys, the first turning a little wheel, and the second supplying the Machine with types

The process of preparing types for this Composing Machine differs from that for the ordinary composing-stick, as follows —the letter is distributed into cases in the usual way, but, as the same exactness is required in distributing for the Machine that is required for the stick, distribution is done by boys. Each letter is then taken out and set up in long lines by boys, as is done in type-foundries This setting up is done at the rate of 5000 letters an hour From the long lines thus formed the Machine is fed by a boy, so that composing may go on without interruption Nor is this done with plain matter only advertisements stuffed with capitals and small capitals, can be composed and justified with equal rapidity

As the Machine can be worked by male or female, after a month or six weeks' instruction and practice, the cost must be very much less than composing by the hand by skilful and high-priced workmen The rapidity of composing by the Machine, as compared with the slowness by the hand, gives a great advantage, and must, when the Machine comes into general use, establish it in newspaper offices

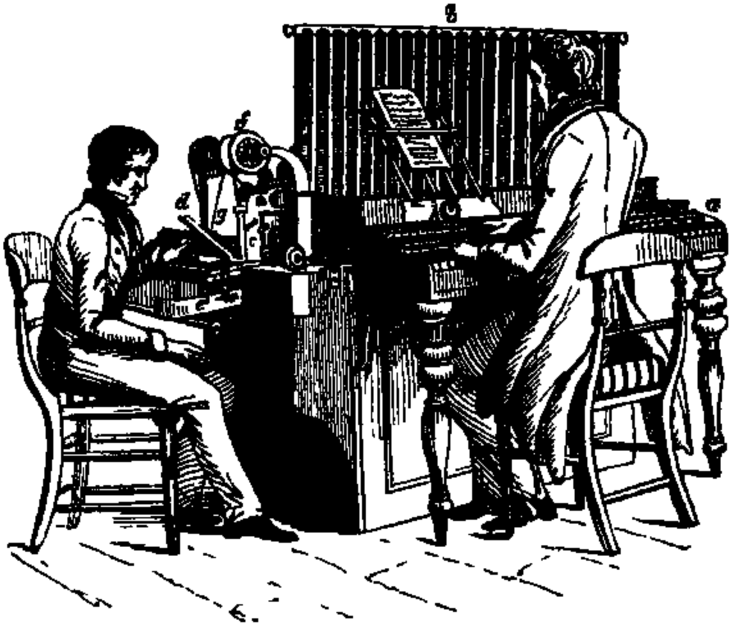
The only point remaining to be ascertained, and that cannot be done without daily experience of its working, is whether it will be regular and certain in its operation, for upon this depends the value of this truly wonderful invention"

ROSENBERG'S TYPE COMPOSING AND DISTRIBUTING MACHINES

THESE Machines, invented and patented by Captain Rosenberg, are an advance upon the apparatus of Messrs Young and Delcambre, just described The latter merely composes, whereas Captain Rosenberg's Machines both compose and distribute, and their setting-up process is muck quicker than that of Messrs Young and Delcambre—one being at the rate of 10,800, and the other of 6000 per hour

Fig 1 *Captain Rosenberg's Composing Machine* —*a*, the keys, on which the chief compositor performs, each key answering a particular letter, fixed above it, engraved upon a small ivory button *b*, rack-frames, or a series of vertical rails, by which compartments are formed for letters, and into which they are lifted into the Distributing Machine *c*, a receiver, to which all the types are conveyed, and in which the line is formed into words and sentences *d*, a justifying stick, into which each line, when complete, is removed from the receiver, *c*, for the purpose of being read over and justified by an assistant-compositor *e*, a galley, into which the assistant-compositor causes each line to slide down from the justifying-stick, after it has been justified, for the purpose of being spaced out. *h*, a counting apparatus, by

which the chief compositor is informed when each line is completed. This apparatus consists of a dial-plate and two hands. The plate is divided into inches and eighths of an inch. One of the hands is moveable, and must be placed at starting upon one of the marks, indicating the length of the lines, or width of the page to be composed. The other hand is so connected with the key movements, that it advances a distance equal to the thickness of each type composed; so that when it comes immediately above the other, that gives notice of the line being complete, when it is instantly removed by the compositor, and another begun. There is also a hammer, which strikes a small bell, as a warning to the compositor, a moment or two before each line is completed.

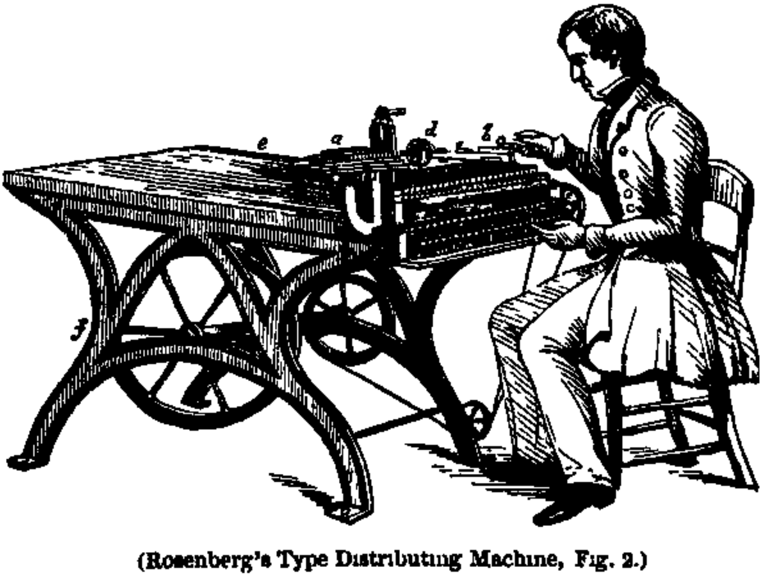


(Rosenberg's Type Composing Machine, Fig. 1.)

The mode of working with the machine is as follows. The chief compositor, who sits at the front of the machine, having his copy before him, performs upon the keys as he reads. By the action of the keys, the corresponding letters are forced out from their respective compartments, and are laid down upon an endless belt or chain, which is constantly passing through the middle of the machine from right to left. By the motion of this chain, the types, when liberated and placed upon it, are quickly conveyed into the receiver; where, by the action of a small eccentric, which is revolving at considerable speed, the types are deposited horizontally, one above the other, in the same order as the keys are performed upon; and are thus formed into lines, supported by a T-shaped slider, which is caused to recede in the same proportion as the types accumulate upon it. As each line is completed, (of which the compositor is informed by the dial and bell,) he turns with his left hand a small winch, (seen in the figure in front of the receiver *c*,) and thus lowers the completed line to the bottom of the receiver; while, by moving with his right hand a lever, (not seen in the figure,) the line is removed from the receiver into the justifying stick *d*. The time consumed in this operation is less than a second. As soon as the line is thus removed, the assistant-compositor, (as shown in fig. 1, at the left end of the machine,) detaches, with his left hand, the upper end of that stick, (its lower end being moveable upon a fulcrum, as represented at *g*,) and having lowered it into a horizontal position, he reads the line, the types standing now in a *vertical* position. Having corrected such faults as may have occurred during the composition, he, by removing a slider, which constitutes the bottom of the justifying-stick, causes the line of type to drop down at once from that stick into a galley, *e*, where he spaces it out.

The principal feature of *novelty* in this machine is, the endless chain on which the types are deposited, and by which they are conveyed into the receiver.

For the details of the advantages, we must refer the reader to the *Mechanics' Magazine*, No. 1003; whose Editor doubts whether the lines can be justified as fast as they can be composed.



(Rosenberg's Type Distributing Machine, Fig. 2.)

Fig. 2—The *Distributing Machine*—is quite detached from the other, and worked independently of it.

a is the galley, into which a portion of the page or column of type, after having been printed off, is transferred. *b* a travelling-carriage, into which the lines are lowered from the galley *a*, line by line, by means of a slider with a handle on it, seen at the top of the galley. From this carriage, the different letters are distributed, by the action of the machinery, into separate receptacles provided for them. *c* are keys, with the letters of the alphabet engraved upon them. *d* a box, fixed to the end of the travelling carriage, containing a convolute spring, by the effect of which the line of type in the carriage is continually pressed against the front of the carriage, until the last type in the line is delivered *e* grooves, made in an horizontal plate, into which the types are received, when distributed from the carriage *b*. In these grooves, the types are formed into long lines, (one sort of letters in each line,) by the revolving motion of a small cam or eccentric, working at the end of each groove. (This part of the machinery is necessarily omitted in the engraving)

A line of type having been lowered from the galley *a*, into the carriage *b*, the distributor takes hold of the handle on this carriage by his right hand, and moves it towards the right. He then reads the line over, and having, by the fore-finger of his left hand, raised the key belonging to the letter, which now is nearest to the front of the carriage, he moves the carriage to the left, until it is stopped by the action of the key he has thus raised The effect of this is, that the letter corresponding with that key is, through the machinery, forced out from the line, and falling down from a recess which is made to receive it, is guided into its own groove in the horizontal plate *e* when by the action of the small eccentric or cam, (working at the end of each groove,) it is instantly pushed forward, for the purpose of giving room for the next type to fall down

In this manner, the types are distributed and arranged into lines—all the *a*'s in one line, the *b*'s in another, and so on, ready for being replaced into their corresponding compartments in the composing-machine This operation of replacement is performed through the medium of an instrument denominated "*the feeding-stick*," by which 200 or 300 letters may be lifted at once from the distributing machine, and transferred to the composing machine.

The number of letters which a lad, with the aid of the machine, can distribute, and replace in the composing machine, is only 6,000 an hour, but this difficulty may be surmounted by employing an extra distributing machine

CASHMERE SHAWLS

FROM Mr. Vigne's *Travels*, lately published, we select and abridge the following minute account of the manufacture of the celebrated Shawls of Cashmere, or Kashmir —

There are now but five or six hundred shawl-frames in the city of Kabul. Formerly, they were infinitely more numerous It occupies six or seven frames, of two men at each for six months, to make a pair of very large and handsome shawls The Poshm-i-Shahal, otherwise Poshmina, (Poshm signifies the wool of any animal,) or shawl-wool, is found upon the goats that are pastured upon the elevated regions of Ladak and Changthung. It is, undoubtedly, a provision of nature against the effect of the intense cold to which they are exposed, and is found not only upon the common goat, but upon the Yak or Tibetian grunting ox, and the shepherd's dog which is used in the same inhospitable regions The poshm is a cotton-like down, which grows close to the skin, under the usual coating of hair

Goats producing this shawl-wool are common in the countries west of the Caspian, and excellent shawls are made there also Raduk, a village and district upon the right bank of the Indus, about seven or eight days' march from Lehin, (the latter being the name of the province,) seems to be the first and principal rendezvous of the traders in poshm, which is collected in great quantities from the flocks that are pastured upon the vast plains of Changthung

The Kashmirian merchants purchase the poshm at Leh, at the rate of eighty puls, (small handfuls,) for a small rupi It is then cleaned on the spot, and one part in four is only fit for the purposes of the weaver

The thread is then dyed of different colours, and of these they use about forty different kinds Their blues and purples are made chiefly from indigo, their yellows from a Panjabi flower called gul-i-kysu, and from a grass called woftangil in Kashmir, their blacks are procured from iron-filings and wild pomegranate skins, from which also a light brown is obtained, their red from kermes and logwood, and a native wood called lin, a drab from walnut-peels, and the finest of their greens, and a light blue also, are extracted from English green baize All the thread used in making a large pair of shawls does not weigh more than fifteen or twenty pounds English, and may be purchased for 120 to 150 small rupis After the thread is dyed, it is dipped in rice-water, a process which makes it stronger, and fits it to be more safely moved by the shuttle, and the stiffness is removed by washing The undyed shawl-stuff, which sells at five rupis the yard, is called ubra, from ubr, (a cloud,) or alwan i-sadah, (without colour,) if white, and if a border be worked on it, the remaining white is called "mutun"

Alwan, as the shawl-stuff is called when free from ornament, is not often, if ever, made up by the Kashmiri weavers of the natural colour of the poshm, and may be, of course, dyed of any colour—red, blue, green, yellow, &c When made with coloured stripes or flowers on it the chograh of the Afghans, or al-khalek, the long under-coats of the Persians, are made from it If the pattern be worked with the needle, the shawl is far inferior in every respect to those in which the pattern is woven in An excellent pair of the former description may be purchased in Kashmir for 150 rupis, (about £10), whereas an equally good pair of the Usuleh, (the real), or the latter kind, could not be procured for less than 700 or 800 rupis

The productions of the Kashmirian looms, which are of old and unimproved construction, are very numerous Du-shalah, or two shawls, they being always made in pairs, Jamaweh, for bedding, Rumal, or handkerchiefs, Hasheyi, or the shawl of a coloured ground with a small border, Urmuk, resembling very strong nankeen, and the Yek Tar, (one-thread), a most light and beautiful fabric, being of one-half the thickness of the common shawl, and invented for the Sikh turbans. Besides the above, gloves and socks are manufactured from the shawl-wool, but they also make Gulbudun, or red silk cloth for ladies' trousers, and Chikun, or flowers worked in silk upon a cotton ground, similar to those procured at Multan. Sashes and trouser-strings are also made from silk, whilst Lungehs, or pieces of blue cloth for turbans, and Kumurbunds, or waist-cloths, are prepared from cotton, and rugs and horse cloths, &c, from wool. A cloth called "Siling" is manufactured from the shawl-wool in Yarkund and China, it somewhat resembles a coarse English kerseymere in texture.

It becomes necessary to wash the shawls, in order to deprive them of the stiffness of the rice-starch remaining in the thread, and for the purpose of softening them generally. The best water for this use is found in the canal between the lake and the flood gates at the Drogjun. In this the shawl is placed, and water being poured over it, it is stamped on by naked feet for about five minutes, and then taken into the canal, by a man standing in the water. One end is gathered up in his hand, and the shawl swung round and beaten with great force upon a flat stone, being dipped into the canal between every three or four strokes. This occupies about five minutes. The shawl is then dried in the shade, as the hot sun spoils the colours, and in ten days afterwards the coloured shawls undergo a similar process, but occupying less time. The white ones, after being submitted to the process, on the first day are spread in the sun, and bleached by water sprinkled over them, they next are again treated in the same process as the coloured shawls, being stamped upon and beaten a second time, and then bleached again till they are dry and then for a third time beaten, stamped upon, and finally dried in the sun. In the second time of stamping soap is sometimes used, but is not good generally, and is never used for the coloured shawls, as the alkali might affect the colours. There is something in the water of the canal which certainly communicates to the shawl a softness, which cannot be given to those manufactured at any place in the plains of Hindustan. At the same time, those made in Paris or at Norwich would, probably, be as soft, were it not for the greater closeness of texture consequent upon their being made by a machine instead of the hand. For the same reason, it is well known that the calico made in India is much softer, and is much more durable, than that made in England. Old shawls that require cleaning, and in some instances new ones, are washed by means of the freshly-gathered root of a parasitical plant called kritz. A pound of it is bruised and mixed with about three pints of water, and to this is added a mixture of pigeons' dung, (a piece equal in size to a turkey's egg,) mixed and beaten up with about the same quantity of water, next the shawl is saturated with the liquor and then stamped upon, washed with the hand, and then well steeped in the canal In the plains, the berries of the raynti fruit, stirred up with water, yet not so as to form a lather, are used for washing a soiled shawl A smaller root, known also by the name of kritz, is used for cotton cloths

The colours of a shawl after it has been washed, are often renewed so well as to deceive any but the initiated, by pricking them in again with a wooden pin, dipped in the requisite tints The fine pale yellow colour of a new shawl is given by means of sulphur fumes A hole is made in the floor about a foot in diameter, and six inches in depth Over this is placed a small square chimney of poplar-wood, open of course above Some lighted charcoal is put into the hole and over it is sprinkled a small handful of bruised sulphur Around the chimney, and about two feet distance from it, is placed a horse or framework about five feet six inches in height, upon this, four shawls are suspended, and the external air is further excluded by another drawn over the top When the sulphur is consumed the shawls are withdrawn, and others are subjected to the fumes of fresh sulphur They are kept until the next day, then washed again in water, dried and pressed, several together, between two boards

The fool's cap, or cypress-shaped ornament, so commonly worked on the shawls, is a representation of the jigeh, or kashkeh, or aigrette of jewels, which is worn on the forehead in the East

STRUCTURE OF IRON

On June 21, was read to the Institution of Civil Engineers, a paper by Mr Charles Hood "On some peculiar changes in the Internal Structure of Iron independent of and subsequent to the several processes of its Manufacture" It was contended that any bar of iron, even of the most fibrous and tough character, being subjected, when cold, to percussive action, would assume a crystallized texture, and eventually break, that this would be materially hastened by the effects of partial heat and magnetism, that the effect of vibration is most sensibly felt in the immediate proximity of the cause of it, that the tough and fibrous character of wrought iron is produced by art, and in all the changes that have been described we see an effort at returning to the natural or crystalline structure common to a large number of metals, and that the rotating of railway axles renders them peculiarly subject to this influence The arguments were illustrated by many practical examples and specimens of iron broken under various circumstances, and the general conclusions arrived at appeared to be, that there is a constant tendency in wrought iron, under certain circumstances, to return to the crystallized state, that this crystallization is not necessarily dependent upon time for its development, but is determined by other circumstances, of which the principal is vibration, that heat, although it assists, is not essential to it, but that magnetism, whether induced by percussion or otherwise, is an essential accompaniment of the phenomena attending this change Many other considerations were adduced, such as the rigidity of the carriages, the looseness of the axles in their brasses, &c , and in the discussion which ensued, the question as to the amount of change in texture, which was produced during the process of manufacture by hammering, was debated; and an improvement in railway axles, by making them hollow from two-rolled skelps, and welding them along the sides in swages at one heat, under the patent by Mr. Yorke, was described, and exhibited to the meeting.

COTTON FELT CUIRASS.

M. SEGUIN has reported to the Academy of Sciences, at Paris, a series of experiments performed on the Cuirass made of Cotton Felt, the invention of M. Papadapoulo. The Reporter states, that the balls of cavalry pistols, fired at a distance of from three to five paces, only penetrated to the depth of about the third of an inch.

SOCIETY OF ARTS.

ON June 6, the Rewards adjudged by the Society during the session were presented to the respective candidates. The following are the awards in Mechanics and other Practical Arts:—

To Mr Henry Goadby, 18, South Villa, Wandsworth Road, for his method of putting up anatomical preparations, the gold medal.

To Mr William Middleton, 7, Wakefield Street, Brunswick Square, for his coachmaker's fence router, the silver Isis medal.

To Mr. W. Bowser, Jun., 4, Swan Street, Minories, for his method of casting a screw, the silver medal.

To Mr Charles Cameron, 60, Gascoigne Street, Liverpool, for his method of bleaching palm oil, 7*l.*

To Mr John Terry, No 18, Mape Street, Bethnal Green, for his improvement in the hand-loom for weaving silk, the silver medal.

To Dr William Montgomerie, Singapore, for the cultivation of nutmegs in the islands of Singapore, the gold medal.

To Mr J. T. Warner, No. 13, Spann's Buildings, St. Pancras, for his improved ruling machine for engravers, the silver medal.

To Mr Joseph Williams, 3, Coleman's Buildings, John's Row, St. Luke's, for his eel-skin cords and ropes, the silver Isis medal.

To Mr. V. Pike, 8, St. Anne's Court, Wardour Street, Soho, for his machine for blocking bonnets, the silver medal.

To Mr John Hick, Jun, Bolton, Lancashire, for his elliptograph, the silver Isis medal

To Capt. T. M. Bagnold, R.M, Wilderness, Saxmundham, Suffolk, for his improved mortar for shipwreck, the silver medal.

To Capt Thomas Dickinson, R.N., 13, Grove Road, St. John's Wood, for his diving bell, &c, used in the operations at Cape Frio, in 1831, for recovering the treasure sunk in His Majesty's Frigate Thetis, the gold Isis medal.

To Mr. Henry Potts, 5, Booth Street, Bethnal Green Road, Spital Fields, for his improved loom for weaving horse-hair, the silver Isis medal and 5*l.*

The Thanks of the Society have been voted to

J Lake, Esq, 39, Broad Street Buildings, for his elevating bed for invalids.

Mr. S. Nicholls, 19, Salter's Alley, Wapping, for his hook for a lathe-band.

Mr Robt McEwen, High Mark, near Stranraer, Wigtonshire, for his additional communication on his apparatus for preventing explosion in steam-engine boilers

Mr. C. Williams, Charles Street, Westminster, for his table for teaching arithmetic.

Messrs. Porter and Co, 149, Cheapside, for their patent anchor.

Mr. E. Whitesides, 14, Bateman's Buildings, Soho, for his method of preserving iron from rust.

Joseph Glynn, Esq., F.R.S., for his communication on titanium found in the blast furnaces at the Butterley iron works.

Wm Acton, Esq., 6, George Street, Hanover Square, for his glass syringe.

Mr. J. Farrant Penzance, Cornwall, for his improved beacon buoy.

Natural Philosophy.

THE CAVENDISH EXPERIMENT

Experiments with the Torsion-rod, for determining the Mean Density of the Earth

IN the year 1835, a committee was appointed by the Royal Astronomical Society for the express purpose of repeating the Experiments of Cavendish with the Torsion rod, under new circumstances, and with all the improvements of modern artists No effective steps, however, were taken for carrying the measure into execution till the autumn of the year 1837, when Mr Airy, the Astronomer Royal, (one of the Vice-Presidents of the Astronomical Society,) applied for, and obtained from His late Majesty's Government, a grant of 500*l* to defray the expenses of this object

Whilst the subject was in agitation in this country, it appears that the same experiment was undertaken by Professor Reich, of Freyburg, in Saxony, and an abstract of his results will be found in the *Year-Book of Facts*, 1839, p 82

Mr Baily carried on his experiments at his own house, which he found as suitable and fit as any that could have been erected for the express purpose The house stands detached from any other building, in a large garden, some distance from the street, and consists of one story only The experiments being completed, on May 13 and June 10 last, Mr Baily communicated to the Royal Astronomical Society a most interesting account of this important investigation, wherein he described the rooms in which the experiments were made, and the apparatus constructed for the purpose Although this was in a general view similar to the apparatus of Cavendish, yet in some respects it was essentially different The great balls, (or *masses*, as they are called,) were suspended from the ceiling by Cavendish and Reich but Mr Baily supported them, from the floor, on a plank which turned on a pivot, and suspended the small balls from the ceiling, thus reversing the mode of operation This method of moving the masses he considers to be a great improvement for he says, "nothing can exceed the ease, the steadiness, and the facility, with which these large bodies are moved and during the many thousand times that they have turned backwards and forwards I have never observed the least deviation from the most perfect accuracy At the final close of all the experiments, the pivot turns as steadily, as freely, and as accurately, as at the commencement of the operations" The small balls were also, by Cavendish and Reich, suspended by a fine wire from the ends of the torsion-rod, whereas, Mr Baily screwed them to the ends of the torsion-rod, of which they thus formed an integral and solid portion The motion of the torsion-rod was observed by means of a reflected image of the scale, from a small mirror attached to the centre of the torsion-rod, in the manner proposed by Gauss in magnetical experiments, and adopted by Reich Some minor alterations were likewise made in the construction and arrangement of the apparatus.

Mr Baily made use occasionally of several small balls, of different sizes, and formed of different substances, with a view of ascertaining whether the results would be affected by such a variation these were platina, lead, zinc, glass, ivory, and *hollow* brass, varying from 1½ to 2½ inches in diameter. The mode of suspension was also diversified with a similar view: iron, copper, brass, and silk, were successively used, not only single, but also double. The mean weight of *each* of the great balls, (or masses) was 2,663 282 grains, or about 380½ pounds avoirdupois, as determined by the accurate weights and scales of the Bank of England. And the weight of each of the small balls varied from 1950 to 23,742 grains. The length of the suspension line was 60 inches, and the length of the torsion-rod, (between the centres of the two balls affixed thereto,) was nearly 80 inches The torsion-rod was made of fine deal, of an uniform shape throughout its whole length, and weighed only about 2300 grains. Another torsion-rod was afterwards made, for some special experiments, the weight of which was nearly ten times as great. it consisted of a solid brass rod, and was occasionally used without any balls attached to the ends.

The torsion-rod and the suspension-lines were screened by a mahogany box, in form exactly like that used by Cavendish, but supported from the ceiling in a very firm manner, and unconnected with the floor or any other part of the surrounding apparatus Every precaution was taken to secure the torsion-rod from the influence of any sudden or partial change of temperature, and also to insure the stability and firmness of the support to which it was attached Subsequently, at the suggestion of Professor Forbes, of Edinburgh, as a remedy for the *radiation of heat* from the masses, (which was thought to cause certain anomalies,) the masses were *gilt*, and the torsion-box inclosed in a gilt case, and previously covered with thick flannel.

With respect to the system of operations, the author states that the torsion-rod is never at absolute rest, but is constantly in a state of vibration on its centre, and consequently, when the end of it is viewed at a distance with the telescope, it appears to oscillate on each side of a mean point, called the *resting-point*, which, however, is by no means permanent or stationary.

The only two objects requiring close attention, for the purpose of obtaining results from any of the experiments, are the determination of the *mean resting-point* of the torsion-rod, and the time of its vibration, both which can be observed with the greatest ease and accuracy, however anomalous they may be. In each experiment, too, the exact distance of the centre of the masses from the centre of the balls must be accurately ascertained. This has been effected by means of plumb-lines, which abut against the masses, and the distances between which are measured, at every experiment, by means of a microscopical apparatus, carefully adjusted.

The author details the various experiments that he has made, amounting in the whole to 2153. The following short synoptical view will enable the reader to form an estimate of the general results obtained from the different balls, according to the manner in which they have been successively suspended. The seven different balls employed are arranged, in the first column, in the order of their weight; and the number of experiments made therewith, together with the mean resulting density therefrom, is classed in the three collateral columns, according as the suspension was formed of double silk lines, double metal wire, or single copper wire. The three detached series, at the bottom of the table, containing 149 experiments, will be presently explained.

Balls.	Double silk.		Double wire.		Single wire.	
	No.	Density.	No.	Density.	No.	Density
2½-inch lead	148	5·60	130	5·62	57	5·58
2-inch lead	218	5·65	145	5·66	162	5·59
1½-inch platina......	89	5·66	..	..	86	5·56
2½-inch brass	46	5·72	..	..	92	5·60
2-inch zinc	162	5·73	20	5·68	40	5·61
2-inch glass	158	5.78	170	5·71	..	..
2-inch ivory......	99	5·82	162	5·70	20	5·79
2½-inch lead, with brass rod			44	5·62		
2-inch lead, with brass rod			49	5·68		
Brass-rod, alone			56	5·97		

Of course, in so vast a number of experiments, there are discrepancies; but, assuming every experiment to be of equal weight, the mean result of the whole 2004 experiments is 5·67. The general mean result obtained from these experiments is much greater (equal to $\frac{1}{23}$th parts) than that deduced by Cavendish or Reich, who both agreed in the very same quantity, namely 5·41: but Mr. Baily does not assign any probable cause for this discordance.

In the 149 experiments remaining to be noticed, and made with the brass torsion-rod, the results show that the attraction of the masses on the rod should be diminished about $\frac{1}{20}$th part, in order to render these three several results consistent with each other, and also accordant with the same balls and the same mode of suspension, attached to the lighter wooden torsion-rods.

We have condensed these leading details from an Abstract of Mr. Baily's Notice, in the *Philosophical Magazine*, No. 136. A full Report of the inquiry will be duly published.

TERRESTRIAL MAGNETISM.—MAGNETIC AND METEOROLOGICAL CO-OPERATION.

Major Sabine has read to the British Association, the Annual

Report, (drawn up by Sir John Herschel), of the Committee appointed to superintend the Simultaneous Observations on Terrestrial Magnetism and Meteorology, and the progress made.

The Committee have great pleasure in being enabled to continue their hitherto favourable Report of the progress of the important operations which they have been delegated to watch over. The extent of operations is now vastly increased, by new foreign establishments observing upon the same concerted plan—and at the same hours—by the adoption of a system of colonial and national magnetic surveys, based upon, and correlative with, the fundamental determinations at the fixed magnetic centres—and by the introduction of new instruments and processes of observation, affording great facilities for magnetic determinations to travellers both by land and by sea. The Report was subdivided into several distinct sections.

1. *The Antarctic Expedition.*—Last year's report brought down the progress to the departure from Hobart Town, in Nov. 1840. The published extracts from the despatch of Capt. Ross, dated April 7, 1841, containing the details of the success of the expedition in penetrating the barrier of ice, &c., must be too fresh in recollection to need any recapitulation. It is with the magnetic observations and results of this voyage only that our immediate concern lies. Landing on the Auckland Islands shortly after leaving Hobart Town, Capt. Ross observed there the November term of 1840. Abandoning, then, by reason of the ill success of his predecessors in that direction, his original intention of sailing across the isodynamic oval surrounding the points of maximum intensity, his adopted course led him between the two southern foci. And although his return to the northward was by a more westerly route, it seems probable that he was still to the eastward of the present locality of the greatest intensity. The magnetic observations accumulated in this voyage have only lately reached England. Their full import cannot yet be known; but it is understood that intensities have been observed by Capt. Ross in these regions exceeding 2½ times the maximum observed by him near St. Helena in the outward passage; and that the general aspect of the intensity observations would appear to place the centre of the principal isodynamic oval in a latitude somewhat exceeding 50° S. The intensity in lat. 76°, where the nearest approach was made to the magnetic pole, was found to be actually less than in 47° S. The nearest approach to that interesting point, viz. the magnetic pole, was made in lat. 76° 12′, long. 164° E.—the dip being 88° 40′.

It was mentioned in the last report, that the publication of the magnetic observations of the expedition had, at the request of the Admiralty, been placed under the supreintendence of Lieut.-Col. Sabine. The first portion of this work has been published in the *Philosophical Transactions* of the present year, containing the observations of intensity made at sea between England and Kerguelen's Land. In this paper, the 3d of a series of "Contributions to Terrestrial Magnetism," which were stated to be due to Col. Sabine's zeal and industry, the whole series of intensity-observations made on board each of the ships with Fox's statical deflecting magnetometer, are carefully analysed, projected, and reasoned on The results are every way most satisfactory as regards the probability of observing with precision at sea, in all sorts of weather—as a proof of which, it will be necessary only to mention, that of 647 observations of this kind, made between London and the Cape, on board the *Erebus*, one only was found so far irreconcileable with their general tenor as to be described doubtful while the observations taken on board both ships, when compared, exhibit a steady accordance which cannot be accidental, and may well be termed beautiful From this examination it would appear (if earlier observations can be relied on), that the line of least intensity on successive meridians is travelling northwards.

In addition to the sea-observations, the expedition, since the last report, has made absolute determinations, and observed terms, as follow —

1840	Nov	Auckland Island
1841	May and June	Van Dieman's Land
,,	July	Sydney
,,	Aug Sept Oct Nov	New Zealand

The November term having been kept in the Bay of Islands, the expedition, according to the last letter received from Capt Ross, dated Nov 22, 1841, was to sail thence the day following, to resume the exploration of the Antarctic regions His intention as stated in that letter, was to traverse the isodynamic oval surrounding the forms of greatest intensity, supposed to be in lat 60°, long 235° E , commencing in long 210° lat 52° or 53° S , and, steering thence directly south to the edge of the ice-pack, make, in reaching it, for the point at which the first year's exploration of the coast of the new continent terminated, with intention to pursue the barrier, wherever its course may lead The working out of this arduous undertaking may, of course, involve a winter spent within the Antarctic circle Should it be otherwise, we may expect shortly to hear of the arrival of the expedition at the Cape or at the Falkland Islands , but in the event of that tremendous alternative, another year at least must elapse without the possibility of any accounts being received

2 *British and Foreign Observatories Extension of the period for which the British Establishments have been granted by Government, for a fresh period of equal duration* —All the British and Indian observatories, except that at Aden, as well as the continental ones, which can be regarded as intimately connected with, and bearing part in, the great operations in progress, are, of course, and have long been, in full activity The Russian Government has been preeminently active in the establishment of new observatories , and supported by the powerful protection of M Le Conte Cancerine, the minister of finance, as well as aided by funds placed at his disposal for the purpose by Mentchikoff, and other Russian noblemen of distinction, the zealous and energetic director-general of the Russian observatories, M Kupffer, has succeeded in procuring the establish-

ment, and bringing, by his personal exertions, into a state of efficient activity, magnetic observations at Kasan, Barnaoul, Nertschinsk, and Catherinebourg; obtaining the re-erection of the old and inefficient observatories of Tiflis and Nicholaeff, and the prospect of a foundation for the same purposes at Moscow, under the auspices of Count Strogonoff, curator of that city.

The vast development of the original plan of operations, followed up as it has been by almost every European power, has, of course, not been accomplished without the lapse of much valuable *time*, consumed in the necessary preparations—the instruction of officers, their conveyance to their ports of destination, erection of observatories and establishments, and adjustment of instruments. The original term of observations granted by Her Majesty's Government and the East India Company, was three years, which have just expired; the continuance of the system for three additional years has been secured. Although what has been done may be considered preparatory to what is to follow, yet its actual independent value should not be overlooked. Were it only on account of it affording so vast a basis of comparison with the itinerant results of the Antarctic expedition, it would have been inestimable. The demonstration it has afforded of the ubiquity over the whole globe of those singular disturbances to which the name of magnetic storms has been applied, could have been no otherwise obtained, and is in itself a physical result of the first importance. The data it has afforded for the revision of the Gaussian theory are numerous, and beyond all comparison more exact than any which had ever before been collected. In short, the operation hitherto has been conspicuously successful.

3. *Magnetic Surveys: Southern Africa.* — Lieut. Clark, and one additional gunner, have joined Capt. Wilmot and the magnetic establishment at the Cape. It is proposed that the survey shall comprehend, in addition to the colony itself, as extensive a portion of the earth's surface in all directions from the observatory as time and circumstances will permit. Application has been made to the Admiralty to permit the sea-portion of this survey to be carried into execution by occasional opportunities which the admiral at the Cape station may be able to afford in Her Majesty's ships and vessels under his command. This will include the coasts of Africa on either side of the Cape. The expediency of completing the circle by an excursion into the interior will be taken into consideration. Already have inquiries been set on foot as to necessary provisoes for, and circumstances of, such excursion. The Geographical Society have also furnished notices of high interest as to the points of geographical discovery which might be accomplished; including the Great Lake in the interior of South Africa, which has never yet been visited by any European.

North America.—Lieut. Lefroy has been appointed to succeed Lieut. Riddell as principal director of the observatory at Toronto, and was to proceed to America in a few weeks. Since Lieut. Riddell's return to England, in January, 1841, on account of health, the observatory at Toronto has been conducted in the most satisfactory manner by Lieut. Younghusband, on the excellent system established there by Mr Riddell The Hudson's Bay Company have most liberally undertaken to furnish conveyance in the summers of 1843, 44, 45, over the countries of the north and west of Canada, extending to the shores of Hudson's Bay and to the Pacific Ocean, and have made the farther offer of a passage in one of their annual ships from Hudson's Bay to England, so as to include in the survey the interesting magnetic region of Hudson's Bay and Straits The operations thus contemplated in the north will connect themselves with magnetic surveys actually in progress by several distinguished magneticians in the United States. Mr. Bache has, during the last summer, completed the systematic survey of Pennsylvania, including the three elements of declination, inclination, and intensity. Prof Loomis has extended his series of observations over many parts of the States of Ohio, Indiana, Illinois, and Missouri M Nicollet has also observed in the same region, and Dr Locke has added a contribution These and other similar observations expected from the interest excited through the United States by magnetism, will connect the northern British survey with the determinations of Capt. Barnett, R N, commanding H M S *Thunder*, on the southern coasts of the United States, in the Gulf of Mexico. Capt Barnett is well provided with instruments both for sea and land observations, and has shewn himself a zealous and careful observer.

4 *Observations made at Sea.*—To extend and facilitate the use of Mr Fox's valuable instrument, a set of instructions for its use has been drawn up by Major Sabine, and furnished by the Admiralty for general circulation The use of this instrument has been adopted, and the same system of daily observation practised with it as in the *Erebus* and *Terror*, by Capt. Blackwood in his surveying expedition to Torres Straits; and the example, it is to be hoped, will be followed, not only in voyages designed expressly for purposes of discovery and exploration, but in ships pursuing ordinary tracks, so as at length to furnish data for the construction of complete magnetic sea-charts, founded on observations alone for the important elements, inclination and intensity, as well as for the declination. Care is enjoined with regard to climate, the influence of iron in ships in which such observations may be made, and reference is given to instructions for this purpose, as regards the declination, issued by the Admiralty, and substantially the same with those given by Col. Sabine in his paper on the compass-deviations on board the *Isabella* and *Alexander* in the Arctic voyage of 1818. The value of the series of Captain Belcher's (R.N, H M S. *Sulphur*) magnetic determinations was acknowledged. The first portion of them has been reduced by Col. Sabine, and published in the *Phil Trans.* for 1841. The determinations have been continued in the islands and coasts of the Pacific and China seas. The observations have arrived in England, and were shortly to be reduced, forming altogether a valuable contribution towards the data accumulating for the revision of the numerical elements of Gauss' theory. The final

publication, during the previous year, of Professor Erman's magnetic results in his journey into Siberia and voyage round the world, was also signalised

5 *Magnetic Disturbances* —M Gauss truly remarks, that "it is one of the great results of British enterprise, that the existence of disturbances extending over the whole globe has been ascertained" As a physical fact, deeply connected with the general causes of terrestrial magnetism, this is indeed of the first importance, and its consideration, under all its circumstances, and especially as modified by distance and geographical locality, is eminently calculated to lead to speculations on those causes, and to theoretical views tending to connect those abrupt variations with the usual course of the magnetic phenomena To disconnect, in the phenomena of these magnetic storms, what is local from what is general, and to trace individual shocks occurring in them from observatory to observatory, and from station to station, until they become so far enfeebled by the effects of distance from their origin, as to be confounded and marked by the growing influence of other shocks whose point of action is nearer,—is now one of the principal points to which attention must be directed The occurrence of many and remarkable storms during the continuance of these observations, at the most distant localities, and with all their detail of circumstances has given a very high degree of immediate interest to this branch of the inquiry, and occasioned a change in the contemplated order of publication of the reports It has been considered advisable to collect together, from all the returns, those cases of remarkable disturbances observed arrange them in chronological order, and publish them in volumes by themselves Among those which will be included in this first publication, the great disturbance which occurred on and about 25th September, 1841, though not the greatest in point of actual deviation which has occurred, is yet, in many respects, one of the most remarkable

Anomalous magnetic movements of unusual magnitude take place, on the average, three or four times in the month but apparently with greater frequency in some months than in others And the returns from the different stations shew hitherto, without exception, that these disturbances are general, that is to say, that though the movements individually may not be, and in fact are not, always *simultaneous*, the observations of the same day never fail to exhibit unusual discordances at all the stations Generally, the disturbances are characterised by a diminution, more or less, of horizontal intensity, prevailing, more or less, for several hours together, every where, and mostly accompanied by a movement, also general, of the north end of the needle towards the west Experience has somewhat diminished the value of the term as a *principal means of detecting disturbances*, especially since the observatories have adopted hourly observations, by which a departure from the normal state cannot continue long without notice, and thus it furnishes, of itself, all the stations with a natural signal for simultaneous and frequent observations Besides, at the Colonial and East India observatories, under the direction of the committee, the disturbances are watched with the greatest diligence at Prague, Munich, and Greenwich.

6. *New Magnetic Instruments and transportable Magnetometer.*—The great advantages afforded by the latter instrument were set forth. It has become, during the last year, a thoroughly practical one, and will multiply absolute determinations, term-observations, and disturbance observations, far beyond what could ever be done by fixed observatories, and also in localities where such could not be established. Already have these improved instruments and instructions for their use, together with formulæ of correction and reduction, drawn up by Mr. Riddell, been supplied to Captain Blackwood's expedition to Torres Straits, and to Captain Sullivan, proceeding to survey the Falkland Islands; also to Mr. Lefroy, to enable him to keep these terms in whatever parts of America he might find himself on the days appointed. Others were preparing for Capts. Barrett and Groves, R.N., who were engaged in surveys at Bermuda and Malta. From Capt. Allen, R.N., of the Niger Expedition, the November and December terms 1841, kept at Ascension, had been received; also determinations at the same island.

Professor Lloyd's new Inclinometer was especially adverted to. Prof. Lloyd calls it the inductive inclinometer. The principle of it is the measurement of the intensity of the magnetism induced in a vertical bar of soft iron, (which must be considered as due to the vertical magnetic component only), by the direction it is capable of causing in a horizontal bar suspended near it. The details of the construction and adjustment of this instrument are given in Prof. Lloyd's work, entitled *Account of the Magnetical Observatory at Dublin.*

Weber's Inductive Inclinometer and *M. Lamont's Inclinometer* were also described under this head.

7. *Publication of Magnetic Observations, Descriptions of Observations, &c.*—Under this head were noticed briefly the appearance of several works during the past year and memoirs in which observations are recorded or discussed, instruments and observations described, &c. It must suffice here merely to name them. Observations made in Russia under the superintendence of M. Kupffer for the year 1839—1st vol. of the Magnetic and Meteorological Observations made at Prague by M. Kreil, from 1st July 1839 to 1st July 1840—Meteorological Observations on the solstitial and equinoctial Term-days, &c. &c. by M. Quetelet, regularly published in the bulletins of the Royal Academy of Brussels—Descriptions of Magnetic Observations at Dublin, Munich, and at Harvard University, Cambridge, United States, respectively, under the directions of Dr. Lloyd, Dr. Lamont, and Messrs. Lovering and Bond. Dr. Lloyd's paper may be advantageously referred to for a full account of the construction, adjustments, and mathematical theory, of all the magnetic instruments employed, and in this respect must be considered as a very useful and

valuable contribution to the cause in hand. Major Sabine has reduced and discussed, during the past year, the observations of Capt. Belcher on the west coast of America and at Otaheite, in the second series of his "Contributions to Terrestrial Magnetism," published in the *Phil. Trans.* 1841; and in his third series he has passed under examination the sea-observations of intensity made on board the *Erebus* and *Terror* on their voyage from England to Kerguelen's Land.

Prof. Loomis's observations of intensity and dip in several stations in the United States during the years 1838, 9, and 40, have also appeared in the year elapsed. Prof. Lloyd has resumed the subject of the mutual action of permanent magnets, in a supplement to his former paper on that subject, published by the Royal Irish Academy. A considerable extent of correspondence has taken place, embracing, amongst other matters, a variety of practical suggestions, to which opportunity for attention will be afforded.—*Literary Gazette*, No. 1328.

SIMULTANEOUS MAGNETIC DISTURBANCES.

ON the 25th of September, 1841, a most extraordinary Disturbance of the Magnetic Instruments was noticed at the Magnetic Observatory attached to the Royal Observatory of Greenwich. Within eight minutes of time, the declination needle changed its position more than 2½ degrees, (having passed in both directions the range of the observing telescope, which includes the angle); the vertical force was increased by more than 1-30th of its whole value, the instrument having then reached the extremity of its range; and the horizontal force was increased about 1-30th of its whole value. During the appearance of an aurora on the morning when the needles were in an agitated state, the declination needle in less than three hours traversed an arc of 34 minutes. At 2 o'clock, P.M., Gottingen mean time, it was evident that all the needles were affected by some unusual cause of disturbance; and from this time to the discontinuance of the observations, (some hours,) two persons were constantly engaged; one taking the observations with the vertical force magnetometer, the other those of the declination needle and of the horizontal force magnetometer. The day, (September 25,) was cloudy throughout; about 9 h. P.M. a few bright streamers were seen through the clouds; then nothing more till 11 h. P.M., when an auroral arch, about 24 degrees high, was visible for a short time.

Similar disturbances to those observed and recorded by the Astronomer Royal, at Greenwich, on the 25th of September, are stated by a Correspondent of the *Times*, (J. F. W. H.) to have been also observed, at the same time, at the Magnetical Observatories at Toronto, in Canada, at Longwood, in St Helena; at the Cape of Good Hope; and at Trevandrum, at the observatory established by his Highness the Rajah of Travancore. At all these stations, differing so widely in geographical position as to embrace nearly a hemisphere of the globe, the disturbance was of such extraordinary amount as to cause the immediate institution of extra observations. The disturbances continued during the 24th and 25th of September, and their phases, allowing for the difference of longitude, were simultaneous at all the stations. Returns had not yet been received from other stations, but were early expected from many, such as from Simlar in the Himalaya, from Van Dieman's Land, and from the Antarctic expedition under the command of Captain Ross, &c. The writer adds:— "Independent of the great changes in the direction of the needle, the total intensity of the magnetic power of the earth appears to have undergone, at all these stations, and at the same instant of time, fluctuations which may well be regarded as astonishing. The whole magnetic system of our planet seems to have been during those two days, so to speak, in a state of convulsion. Philosophy will, of course, be busy in speculating on the origin of phenomena so surprising; but we must not forget a tribute of praise to the zeal and diligence of the officers charged with the direction of these observations, and who have followed them up so efficiently; nor to the liberality of the British nation, in working out on so magnificent a scale the recommendations of scientific men, in this, by far the greatest combined scientific operation the world has yet seen undertaken."

An Abstract of the observations made at Toronto, Trevandrum, St. Helena, and the Cape of Good Hope, has been printed and circulated at the expense of the British Association, and will be found reprinted in the *Philosophical Magazine*, No. 129.

MAGNETIC DISTURBANCE IN JULY.

PROFESSOR THE REV. D. LLOYD has communicated to the *Philosophical Magazine*, No. 136, a brief sketch of some of the principal features of a Magnetic Disturbance, (the most remarkable ever witnessed by the writer,) which occurred on the 2nd and 4th of July, 1842, and was observed by him at the Dublin Magnetic Observatory. We have not space for the details; but, amongst the many features of prominent interest recorded by the Professor, are the following:—

1. In the great magnitude, and marked and abrupt character of the principal changes. In both these respects, the changes at 6 A.M. and 12 P.M. on the 2d instant, afford, perhaps, the most interesting points of comparison of any that the system of simultaneous observation has yet furnished; and much light may be expected to be thrown on the phenomena by a comparison of the results which may certainly be expected to arrive from the colonial observatories, as well as of those which have been probably obtained at Port Louis, in the moveable observations of the Antarctic expedition.

2. In the striking confirmation which it affords to the conclusion of Professor Kreil, viz. that all the greater changes are accompanied by a diminution in the horizontal component of the intensity. The whole of the day following the disturbance, (July 5) was also characterized by a diminished intensity, which is also in accordance with the inductions of Professor Kreil; but the increase of this element *towards the close* of the disturbance, (in the afternoon of the 4th,) is in opposition to one of his conclusions.

3. In the two classes of changes exhibited; in one of which, (as on the evening of the 2nd,) the disturbances from the mean position, although great and rapid, were accomplished without any sensible vibration of the magnets; while, in the other, (as on the morning of the 4th.) the vibration exceeded any ever witnessed in this observatory, since the application of the copper rings.

4. In the occurrence of great magnetic changes without any marked auroral phenomena. The sky was clear on the night of the 2nd, during a very remarkable part of the disturbance, and a light was seen in the N. W.,—but of a very uncertain nature, and without any of the distinguishing characters of the aurora. However, throughout the 3rd and the greater part of the 4th, the sky was covered during the day with a peculiar milky whiteness, apparently belonging to something distinct from and above the clouds; this disappeared suddenly, and the blue sky became visible about 5 P. M. on the 4th, when the disturbance was at an end. This appearance the Professor could not help regarding as connected with aurora.

An extraordinary magnetic change was also observed at Sir T. M. Brisbane's Observatory, Makerstoun, on the 2nd and 4th. The greatest variations of the needles from their mean positions occurred on the 2nd, about 10½ P. M., Gottingen mean time; and the next to the greatest, on the 4th, at 9 A. M., Gottingen.

VARIATION OF THE NEEDLE—GREENWICH MAGNETIC OBSERVATORY.

The needle is known to have had a westerly variation ever since about 1657. The late Colonel Beaufoy, who made a long series of very skilful and accurate observations on the subject at Bushy Heath, about ten miles N. W. of London, considered that he had ascertained that in March, 1819, this variation had attained its maximum, being then *21° 41′ 42″* W., and that it had begun then to decrease at an annual rate of 1′ 37. A writer in the *Quarterly Review* makes the retrocession contemporaneous with the great breaking up of the Polar ice in 1816, (three years earlier than the date assigned by Colonel Beaufoy), but not on any sufficient authority. In 1839, a Magnetic Observatory was added to our national Greenwich establishment, and the observations which have been since made there, under the superintendence of the Astronomer Royal, Professor Airy, confirm the general correctness of Colonel Beaufoy's conclusions, though they indicate the annual decrease to be greater than he supposed. The results obtained for the last two years are as follow:

1840	20° 23′ 30″ W
1841	23 17′ 40″ W

The Magnetic Observatory at Greenwich is erected on a piece of ground adjoining Flamstead House. The following description of it is given by the author of an interesting article "On Telluric Magnetism," in the *United Service Journal* for March 1842.—"It is entirely built of wood, and completely insulated. The free magnet is a bar of hard steel, 2 feet long, 1½ inch broad, and ¼ inch thick, suspended by a skein of silk fibre from two pulleys fitted to a suspension frame about 9 feet above it. Before the magnet there slide two small brass frames, firmly fixed in their places by means of pinching screws. One of these contains, between two plane glasses, a cross of delicate cobwebs; the other holds a lens of 13 inches focal length, and nearly 2 inches aperture, which combination serves as a collimator without a tube, and perfects the adjustment."

IMPROVED PERMANENT MAGNETS.

THE Rev. Dr. Scoresby has made to the British Association a communication "On Improved Permanent Magnets, the mode of determining their powers," &c. In the cases of compound powerful magnets, where large masses of steel were required, the absolute conditions were, that these masses should be of the best possible quality of (Swedish) steels, of the denomination of cast steel, (and not shear or blister,) and that they should be hardened to the greatest possible degree of hardness. For want of attention to these conditions, the Rev. Doctor frequently found magnets of bundles of eight or ten steel bars, when even two bars would have a stronger power.

The author illustrated these matters by copious explanations, diagrams, and experiments with a powerful compound magnet, consisting of two bundles of steel bars or plates in a wooden frame, which took up 11,000 nails (tin-tacks); which, when in suspension, were capable of being moulded in the most curious manner. Holding a key, (weighing 3,000 grains,) at four inches from the ends of the magnets, this key became temporarily so powerful a magnet as to take up and suspend another key, weighing between 2 and 3,000 grains. Dr. Scoresby showed, that, by drawing a piece of steel down the back of his hand in one direction, the palm of his hand being pressed against his powerful magnet, he could give the steel a considerable magnetic power through his hand; and by reversing the direction of the steel, he could as easily demagnetize it. Of nine sea compasses, sent to him from her majesty's stores, the material of one was not better than the steel for coach-springs, hence it would only lift 600 grains, while his own, of the same weight, would raise 3,309 grains. He had ascertained the means of testing magnets with such accuracy, that it would be as absurd to have a bad compass in future as a bad sovereign.

MAGNETIC BINNACLE.

MR. PAYNE, optician, of Liverpool, after a series of experiments which have occupied eighteen months, has succeeded in producing a Binnacle, so loaded with magnetism as to counteract the local attraction of the compass in iron vessels It is pretty generally known that hitherto the mariner's compass has been useless in iron-built vessels, unless they have undergone a process, invented by Professor Airy, to "compensate" their magnetism. This compensation, for which the vessel under process is to be continually turned and moored, unmoored and turned again, is very tedious, and, consequently, expensive. It consists in placing large magnets at such a distance from the binnacle, or other compass, that their attraction is equal to the deviation occasion d by the magnetic influence of the vessel. Mr. Payne's plan allows the whole arrangement to be executed in the work-shop; and the invention comprises an entirely new method for the circulation of the magnetic fluid. The inventor, it appears, collects and fixes a vast quantity of magnetism in his binnacle, and causes its influence to ascend in a conical direction towards the centre of the compass needle. The magnetism of the iron vessel is attracted to this magnetic arrangement, which cuts off a direct communication between the needle and the vessel, and leaves the needle as free to act correctly on board the vessel as on shore. The magnetic binnacle swings on substantial gimbals within an outer binnacle, covered with the usual brass top, lamp, &c. The saving of expense by this new plan will be considerable, and it will not be liable to an objection, which is advanced against Professor Airy's plan, that the compensation is not lasting. It has been found that a variation in compasses, compensated on the Professor's plan, arises by the iron of the vessel losing some of its magnetic strength by gradual oxydation, paint, &c.; while the large compensation magnets remain in preservation, and, after having been exactly powerful enough, become too powerful. The compensation power of the "magnetic binnacle," on the contrary, cannot be too powerful, but may be not sufficiently so, a defect which is soon seen, and can, of course, be easily remedied.—*Liverpool Albion.*

MAGNETISM AND THE WIND.

On April 16, was described to the Wernerian Society, a Magnetical Instrument, invented and constructed some years ago by Mark Watt, esq., of Edinburgh, which, while standing upon a table in any room, and secluded under a glass shade, points in the direction of the wind. This instrument is formed of a thin bar of wood, 3 or 4 inches long, which traverses, like a compass, upon a steel pivot, by means of an agate capsule inserted into the wood. Three or four magnets are affixed to one end of the bar of wood, which has a slit one-third of its length to receive them. They are placed in a line, at a distance of half an inch from each other. The magnets are very light, being pieces of the main-spring of a watch, made straight, of different lengths, increasing from one inch to three. They are fixed quite perpendicular to the horizon, and therefore deprived of polarity, with all the south poles uppermost, and north undermost. The instrument is not a perfect vane; for although the bar of wood stands exactly according to the direction of the wind, it is indifferent to it which end turns towards the point the wind blows from. Yet several rather interesting deductions in physical science can be drawn from it. It evinces the connection between magnetism and electricity. It also renders it probable that our variable winds are caused by electrical currents, as this instrument anticipates the changes of the wind by a quarter or sometimes half an hour.—*Jameson's Journal*, No. 65.

SUBDIVISION OF TIME.

Mr. Osler proposes to apply the principle of the Vernier to the Subdivision of Time, by having a pendulum, which should make, say ten swings, in the time that the principal pendulum makes eleven; furnished with a small dial, and so placed as that the coincidences, or want of coincidence, could be observed The strokes of such a pendulum being counted, the time of every observed stroke of it, reckoned back from its coincidence with the principal, or seconds' pendulum, would, it is obvious, be found in tenths of a second.

ASTRONOMICAL CLOCKS

Professor Bessel, of Konigsberg, has read to the British Association an important communication on an Astronomical Clock

Having ever been of opinion that that indispensable instrument to the astronomer, a Transit Clock, could only acquire perfection if the pendulum—separate from the whole of the works—were made to vibrate in equal time, whatever the temperature and the arc might be, Prof Bessel gave some hints on this subject. After noticing Mr. Frodsham's ingenious contrivance of an isochronal piece, to compensate for the variation of the arc, he said, supposing that contrivance had been successful, there would be no more any difficulty in making the rate of the pendulum independent, as well of the vibration of the arc, as of the heat. He would submit, whether the expeditious method of coincidences might not be employed for checking the pendulum in both respects.

The pendulum, apart from the clock, being suspended from the wall, a clock, taken out of its case, might be placed before it at a distance of 6 or 8 feet, an object-glass of 3 or 4 feet focal length might be placed between both, so as to produce, exactly at the lower end of the pendulum of the clock, an image of the lower end of the other pendulum Then the coincidences of both might be accurately observed, by a telescope placed at a convenient position for seeing both Similar contrivances had been described in an account of some pendulum experiments made at Konigsberg, and the accuracy of the method was such, that the relative rate of both pendulums might be ascertained with sufficient accuracy in a short time—in from 10 to 20 minutes. The rate of the pendulum was to be tried at different temperatures, being placed in an open box, covered at the lower end with glass, and so fastened to the wall that the pendulum could swing within it. Two metal tubes should be passed through the box, and might be heated with water or steel, so as to heat the air in the box. Previously to heating it, the air should be deprived of its moisture, and two or three thermometers placed in different situations in the box, showed the heat to be pretty uniform. Then, if the pendulum were swung before and after heating, it would be easy to ascertain the rate, and compensate for the heat. Prof. Bessel believed that not only the readiness with which both these experiments might be made, but also the perfect isolation of the pendulum, would recommend this method to artists and astronomers; and he had been desirous to try it himself, but had been prevented by delay in the construction of a pendulum provided with Mr. Frodsham's isochronal piece. In the construction of the pendulum, attention should be paid to one thing which seemed to have been much overlooked. It often happened that chronometers affixed to the top and bottom of a clock-case, when it was evident that the compensation was acting only below, would not compensate for the variation of the whole. He should prefer, for this purpose, the gridiron to the other form of pendulum, especially if we began as low as possible below the point of suspension, and endeavoured to carry it on to the centre of gravity. He should prefer the several rods to be of equal diameter, and to act uniformly. Perhaps, the application of galvanism, which Mr. Dent had so beautifully applied to coating spring pendulums with gold, would best answer the purpose.

Supposing the spring perfectly regulated, as well with respect to the heat as the arc, only one cause would interfere with regular vibrating times. This was the effect of that quality of the air which depends on the variations of the height of the barometer; and the other part would depend upon the variations of the thermometer, and the adjustment of the compensation for heat. There was a possibility of compensating the former by fastening a barometer tube to the pendulum, and it would not be difficult to find the suitable diameter of the tube; but Prof. B. was aware that this complication of the pendulum would be rather inconvenient. At all events, the variations of the barometer were not very great, especially if the compensation of the pendulum were made as great as possible. He submitted these hints to those celebrated artists whose admired works had greatly contributed to the promotion of astronomical purposes, and the determination of the longitude.

Sir John Herschel observed that by Prof. Bessel's plan of compensation, the use of vibration was brought within a short period of fifteen or twenty minutes, which, according to the ancient modes of determination, would have taken a whole day.

DENT'S STEEL CHRONOMETER BALANCE-SPRINGS.

Mr. Dent has further reported (see *Year-Book of Facts*, 1842, p. 96) to the British Association,—respecting his Steel Balance-spring, coated with pure gold by the electro-metallurgic process; also of the performance of his clock, in which the impulse is given to the pendulum at or near the centre of percussion. By this contrivance, he proposes to obviate the difficulty occasioned by the oil freezing at low temperatures. The stopping of clocks at very low temperatures has induced the Astronomer-Royal to invent a *new* escapement, which seems to answer all the conditions required; an addition of twelve pounds can be added on to the weight of the clock, and yet a variation is produced in the arc of vibration amounting to *only* five minutes, while an addition of one pound to the weight of the ordinary Graham's escapement makes a difference of fifteen minutes; by Mr. Airy's plan there is always, (if the term might be used,) an extra reservoir of force; keeping the train of wheels always up to their work, and capable of overcoming the resistance occasioned by the freezing of the oil.—*Athenæum*, No. 766.

Mr. Dent's Improvement of the Compensation-balance chiefly consists in the two compensation-pieces being formed into curves, which have a uniform and, at the same time, a double action, without occasioning friction in either piece—one action producing a change in the distance of the compensation-weight from the centre of motion, the other simultaneously taking the compensation-weight either backward or forward, to be so acted upon by the leverage of the first action, that the compensation-weight is taken over any space required for the perfect correction of irregularity arising from temperature; or, in other words, the compensation-weight is moved further down the lever by an increase of cold, and higher up by an increase of heat. In the ordinary compensation-pieces, the distance between the centre of gravity of the weight and the junction of the compensation-pieces is lengthened by decrease, and shortened by increase, of temperature; so that the compensation-weights are removed too far out from the centre of motion by cold, and not brought sufficiently inwards by heat. —*Literary Gazette*, No. 1328.

FRODSHAM'S CHRONOMETER COMPENSATION-BALANCE.

As a certain and effectual method of correcting the Compensation-balance in Chronometers, whereby they may be made to keep the same time both in the extremes and middle temperatures, Mr. Frodsham has exhibited to the British Association, a diagram of the ordinary balance, with the mean-time screws placed on one side of the bar of the balance. In the centre of this bar, on the exterior rim, was screwed a short piece of steel, extending along the outer rim three or four degrees, but perfectly free. In this piece were several small holes to receive a screw, when the balance was corrected by the ordinary compensation-pieces; that if the chronometer kept the same time at 55° or at 90°, it would lose considerably at 32°; the screw in the steel piece was, therefore, to be placed in such a hole, being just in contact with the outside of the rim of the balance: when at 55°, that would reduce the length of the acting part of the compensation; and, in the colder temperatures, would allow it to recede only that distance from the centre of the balance which would make the chronometer keep the same time as in the higher and middle temperatures. One great advantage of this invention was stated to be, that it may be applied to the balance of any chronometer which is now completed on the usual construction.—*Literary Gazette*, No. 1238.

STANDARD WEIGHTS AND MEASURES.

The Rev. Dr. Peacock, dean of Ely, has read to the British Association, the Report of the Commission on this important inquiry. The author, after stating that the Imperial Standards of Weights and Measures, (the yard, the pound, the gallon, and several of their multiples,) had been lost in the fire which destroyed the two Houses of Parliament, mentioned, that a Commission of which he was a member, had been appointed to report on the best means of restoring these standards. The standard pound weight was Troy weight (5,780 grains,) though the pound avoirdupois (7,000 grains) was used throughout the country, in the proportion, perhaps, of 10,000 to one of Troy. The Commission recommended the standard pound to be the representative of the avoirdupois, and not, (as before,) of the Troy pound; that, hereafter, the use of the Troy pound should be abolished, except for a very limited number of transactions, and that the avoirdupois pound should be considered as the standard pound of Great Britain. They recommended that measures of capacity should be determined by measures of weight,—by far the most convenient method, inasmuch as weighing was a much more accurate operation. than, for instance, the formation of a perfect cube. The Commission also ventured to recommend strongly some alterations in the coinage, and the systems of weights and measures, arising out of a more extensive introduction of the decimal scale. The nearly unanimous determination of the Commission was, that any attempt to interfere materially with the primary units of the coinage, weights, and measures in ordinary use, would produce such confusion and bad consequences in the ordinary transactions of life, that they would adhere strictly to all those primary units, viz. the pound sterling of our coinage; the yard in the measure of length, (and also the foot, for there were two primary units in this measure;) the acre, in the measure of areas; the gallon, in the measure of capacity; and the imperial pound, in the measure of weight.

As the coinage must necessarily be the basis of any changes leading to the more extended adoption of a decimal scale,—Taking the pound sterling as the primary unit, they proposed to introduce a coin of the value of 2*s*. (one-tenth of the pound;) another, either silver or copper, of one-tenth of 2*s*. (or 2*d*. and a fraction) which might be called a *cent* (the hundredth of a pound) and the thousandth part of the pound sterling, or nearly the value of our farthing, (of which there are 960 in the pound,) which new coin it was proposed to call a *millit*, (from thousandth.) The difference in the value of the copper coinage was less important, as it was merely a representative coinage, and had not an approximating intrinsic value, like the gold and silver coinage. For the proposed coin of 2*s*. various names had been suggested—as *Victorine*, rupee, and florin; it being not much different from the value of some of the rupees of the East Indies, or the florin of the Continent. Under this new decimal scale, the shilling would be retained, and also the sixpence, but the latter under another name, more representative of its value. For the half-crown would be substituted the 2*s*. or *Victorine*. The author next dwelt at some length on the advantages of this change, in the extensive money transactions and accounts of bankers and merchants: in the establishment of the Bank of England, for instance, where a thousand clerks were employed, it would greatly facilitate the operations of calculation and book-keeping. Thus, discarding *millits*, (for bankers now excluded the subdivisions of a penny in their accounts,) the sum of 17*l*. 3 *Victorines*, 7 *cents* would be represented at once by 17·37; only two places of decimals, instead of as now in pounds, shillings, and pence. It was shown how the principle was applicable, with still greater advantage, in cases of weights and measures, where the scale was now most anomalous and absurd. Suppose the rental or value to be required, and that the land cost 69*l* 3 *Victorines*, 4 *cents* an acre; the reduction in common arithmetic was one of very considerable labour, difficulty, and time. Indeed, if this decimal system were adopted, the labour of teaching arithmetic to school-boys would be reduced nearly one-half But by this plan, (as the rev. author showed,) the result might be obtained in five lines of decimals, containing only twenty-one figures.

The most extensive change in weights recommended by the Committee would be to introduce the uniform weight of 10lb. to the stone. instead of the varieties of 8lb in some, and 14lb. or 16lb in other parts of the kingdom; the hundred-weight to be called *centua*, a German term. These were all the changes proposed in weights.

As to the measure of length, the Commission thought it too violent a change to alter all the milestones, but there would be no difficulty, (with reference to the standing order of Parliament in railway matters, &c) to introduce the measure of 1000 yards, and call it a mil*yard*.

ON WAVES.

MR SCOTT RUSSELL has communicated to the British Association, the results of Experiments recently made by him, which he wished to present as a Supplement to the former Report of a Committee on Waves. (See *Year-Book*, 1841, p. 106; 1842, p 96) On former occasions he had submitted observations that were principally directed to the examination of one kind of wave, but his present communication referred to new and beautiful phenomena of a different class.

Much of the difficulty in attaining clear conceptions of the phenomena and mechanism of waves is to be attributed to confounding with each other, under the general name of wave motion, a variety of phenomena essentially different in their origin, their form, and their laws, and he had now matured this classification. Of waves there seem to be three great orders, obeying very different laws —1, Wave of the first order,—the wave of translation,—is solitary, progressive, depending chiefly on the depth of the fluid: has two species, positive and negative. 2, The waves of the second order,—the oscillatory waves,—are gregarious; the time of oscillation depending on the amplitude of the wave: of two species, progressive and stationary. 3, The waves of the third order,—capillary waves; gregarious: the oscillations of the superficial film of a fluid, under the influence of the capillary forces, extending to a very minute depth short in duration of two species, free, and constrained. To the last of these classes he wished to draw attention, as amongst the phenomena which we most frequently see, and have yet failed to examine. He believed them to be the minute waves or dents indicated by the theory of Poisson: he had, therefore, thought it his duty to examine them. The waves of the third order were observed by Mr. Scott Russell in the following manner:—a slender brass wire was inserted vertically into a still fluid, and drawn in that position slowly along its surface. When the velocity is one foot per second, the surface of the water exhibits a group of waves of great beauty and regularity, extending forward before the exciting point, and spreading on both sides of it in the form of a con-focal group of hyperbolas; the focal distance of each hyperbola, and its asymptotes, being determined by the velocity of the motion. Although the exciting point was no more than one-sixteenth of an inch in diameter, these waves extend over several feet, and the diagrams exhibited the phenomena as having great regularity and beauty. Numerical results, showing the number of these waves in an inch of distance from the exciting point, are nearly as follows:—

Velocity of moving point. Feet per min.	Number of Waves in an inch.
55	2
60	3
65	4
72	5
80	6
90	7
108	8
120	9

These waves were examples of capillary waves, not in free but constrained motion. He had generated them in a different manner, so as to examine them in free motion, uninfluenced by the generating point; and found that the capillary waves, when moving freely, have a constant velocity of 8½ inches per second—that their duration is short, becoming insensible in about twelve seconds after describing a path not longer than eight or nine feet; in the free state, their breadth is very small at first, gradually increases, and just before vanishing attains an amplitude of nearly an inch. The capillary waves are among the phenomena we most frequently observe. It is in generating them that a gentle breeze forming over the surface of a smooth lake destroys the translucent and reflective power of the surface; they are also to be observed in all cases of primary and secondary wave motion, when the superficial film is by any cause compressed, so as to produce corrugation, and they always disappear in about twelve seconds after the exciting cause is removed. The second order of waves had also been made the subject of careful observation. A mode had been discovered of generating these waves in large groups, so that instead of observing single waves, the length of one could be deduced from the measured length of a number, thus getting the advantage of repetition of the quantity observed. It had thus been finally determined, that these oscillating waves follow Newton's law in so far that the velocities of transmission are as the square roots of the amplitudes; but the absolute velocity differs from that of Newton, so that, instead of having the wave whose period is a second of an amplitude = 3·26, it is found to be = 3·57. The velocities determined are as follows :—

Velocity of transmission of Wave. Feet per second.	Amplitude. Feet.
3·01	2·65
3·16	2·94
3·29	3·125
3·37	3·26
3·57	3·57
3·72	3·913
3·84	4·20
4·16	5.00
4·62	6·25

Mr. Russell had also completed some further examinations of the wave of the first order, and could now present the subject in a tolerably complete form.—*Athenæum*, No. 766.

At the late meeting of the British Association, was read a communication from Mr. Walker, (of Plymouth,) who found that waves near the breakwater, in 36 feet water, moved faster, and were further apart, than those in 24 feet water and nearer the pier-head ; but all those waves moving shoreward had their velocities diminished as they approached the shore. He found, in one instance, waves traversed 46 feet per second, and were 460 feet apart, breaking in five fathoms water ; others had a velocity of 42 feet per second, and were 442 feet apart ; the height of the unbroken waves was 27 feet above the surface-level, and they broke in five and six fathoms. Others, again, had a velocity of 46 feet per second, the distance between them was 345 feet, and the height of the unbroken wave only five feet.

THE STEAM-WAVE.

On Feb. 3, was read to the Royal Society, an abstract of a paper "On the Steam-wave," by the Rev. Thomas Boys. The term *Steam-wave* is employed by the author to denote that peculiar kind of wave which is generated during the motion of steam-vessels on the water ; and which, he shows, results from the combination of two separate sets of waves ; namely, those occasioned simply by the progressive advance of the vessel, and which consequently recede from it on each side, nearly at right angles to its course ; and those arising from the impulses given to the water by the action of the paddles, and proceeding in the same direction as the vessel itself. He ascribes the cumulative force acquired by the waves at the parts where they cross one another, to the extraordinay violence of effect with which they strike against all obstacles opposed to their progress, and which renders them so formidable to boats and other small vessels exposed to the encounter.

OIL UPON WAVES.

On June 27, was read to the Academy of Sciences, at Paris, a paper on the effect of Oil in calming the Waves of the sea, by M. Van Beck. M. Van Beck thinks, with Franklin, that the phenomenon may be explained by admitting that there exists between air and water a certain natural affinity or adhesion Water, he says, takes in with avidity the air with which it comes in contact, so that it is with difficulty expelled It results that, whilst a current of air passes over the surface of the water, the air attaches itself to the liquid, and creates small waves, which, as the wind increases, become large and dangerous As soon as these waves are covered with a membrane of oil, the adhesion of the air upon the water ceases to exist, and the surface is no longer disturbed"

"MOUNTAIN HIGH" WAVES

SOME writers have asserted that the height of the Waves of the ocean, from the trough to the crest, reaches often 40 and 50 feet but Dr Arnott, in his *Elements of Physics*, affirms that "no wave rises more than 10 feet above the ordinary sea level, which, with the 10 feet that its surface afterwards descends below this, gives twenty feet for the whole height, from the bottom of any water valley to the adjoining summit" From observations subsequently made with great care in the midst of the Pacific Ocean, by the French Exploratory Expedition, it appears that Dr Arnott was very nearly right The maximum height was then found to be 22 feet —*Mechanics' Magazine.*

TIDES OF THE FRITH OF FORTH

MR SCOTT RUSSELL has presented to the British Association, a "Report on the Abnormal Tides of the Frith of Forth," supplemental to a former Report on the same subject (See *Year-Book of Facts*, 1841, p 106) He had on a former occasion presented the result of tidal observations on the Frith of Forth These observations brought to light the existence of certain very remarkable tidal phenomena, proving the occurrence, on some parts of that Frith, of double tides, or rather perhaps of quadruple tides, being four high waters in each day, instead of only two, as usual When this subject was formerly discussed, Mr Russell attributed those anomalies to the great southern tide wave entering the Frith at a different period from the northern tide wave, to which the periods of high and low water on the east coast of Britain are principally due But other explanations had also been suggested in quarters so high as to entitle them to great respect For the purpose of settling this question, and, if possible, reducing these anomalous tides to some law, Mr Russell had recently instituted a second series of observations on the Tides of the Frith of the Forth, conducted under very careful observers, the height of the tide being observed simultaneously by different observers, at the different stations, who recorded their observations every five minutes, and continued them unceasingly night and day They had only as yet extended over a few weeks, but already there had come out of them results of a decided character, so as to set at rest the question of the origin of these tides, and to illustrate some curious points in the history of littoral tides. The tides already observed had, he thought, proved the accuracy of the theory he had formerly advanced on this subject.

Mr. Russell's theory is this: that the tidal wave is a compound wave of the first order; that its phenomena are correctly represented by the wave which he has called the great wave of translation—that this tide's motion along our shores is correctly represented by this type. Now, the wave of translation in ascending a channel whose breadth and depth vary, exhibits the following phenomena:—First, a velocity varying as the square root of the depth of the channel; second, an increase of height with the diminution in breadth and in depth of the channel; third, a dislocation of the centre, which is transferred forwards in the direction of transmission according to a simple and well-established law. And these changes exactly correspond to the epoch of high water, the law of rise and fall, and the exaggeration of range in the Frith of Forth. Of the four successive high waters of each day, he has ascertained the latter tide of each pair to be *normal*, and the earlier the abnormal tide. It is well known that the tide which brings high water to the east coast of Britain, as far at least as the Thames, comes round the north of Britain, bringing high water to Aberdeen about noon, Leith about two, and London about twelve o'clock at spring tides. This wave is the same which brings to the whole of the Frith of Forth the normal high water, and of the double tides the *later* of each pair corresponds exactly with the time as predicted by the excellent tables of Mr. Lubbock. But if we conceive the great southern wave, which comes up the English Channel, to continue its course northward in the opposite direction to the normal tide, it would enter the Forth at ten o'clock, being two hours previous to the normal tide, due to the succeeding transit of the moon; or the tide E at Leith will consist of the normal tide due to transit B and the abnormal tide due to transit A. Now, the double tides are in exact correspondence with these conditions, the abnormal tide being generally about two hours in advance of the normal tide. But the circumstance which most perfectly fixes the identity of the tides, as due to the successive transits A and B, is found in the character of their diurnal irregularities. If the theory adduced be correct, the normal and the abnormal tides will have opposite inequalities. The observations made exactly correspond with this view; and, so far as they go, establish the soundness of the view which has been adduced for their explanation. Another remarkable confirmation of this view is derived from the examination of the diurnal inequality of places on opposite coasts at the mouth of the Forth; the diurnal inequality on the south side being that due to the northern or normal tide, and that on the northern coast being that due to the abnormal or southern tide wave. At Leith, both waves, meet; whilst, the inequalities nearly neutralize each other, and give only the difference of the inequalities. By the same process, using the wave of translation as a type of the tide wave, some further anomalies of the tide wave were illustrated; and the absence of all tide frequently observed on opposite and adjacent coasts, as at the north of Scotland, and the opposite coast of Norway. These are explained by the fact that the lateral transmission of the wave is slower than its transmission in the direction of its amplitude; so that the rapid advancement of one portion of the wave gives divergence to the branches, which thus separate and leave an interval of diminished tide or of no tide.

The President remarked, that if Mr. Russell established the fact, which he had now so ably brought before the Section, of the separate individuality, even when they had blended, of different waves of translation, so that they were capable of again separating under their proper conditions,—he conceived that he had added a new and important fact to those previously established on the subject.—*Abridged from the Athenæum*, No. 766.

DOLLOND'S NEW BAROMETER.

MR. GEORGE DOLLOND, of St. Paul's Church-yard, has submitted to the Royal Agricultural Society, an improved Barometer for ascertaining the changes of atmospheric pressure. The improvement effected by Mr. Dollond in this important meteorological instrument, not only obviates many of the common difficulties incidental to mountain-barometers, and when out of use and packed up, becomes as firm and secure as a walking-stick, but it embraces in its construction many of the advantages of the stationary barometer or weather-glass, as an indicator of the changes taking place in the weight of the atmosphere. This improvement is chiefly attained by an ingenious contrivance in the arrangement of the mercurial cistern, and the application, for the first time, of an air-tight stop-cock, for regulating the passage of the mercury into the cistern, or enclosing it securely within the tube. Mr. Dollond states the following as the principal advantages resulting from this arrangement:—1. A true and certain state of altitude in the column of the mercury from the highest to the lowest situation on the globe, without the necessity of applying the uncertain and tedious corrections required in ordinary barometers. 2. The uniformity of the observations, arising from the free and unobstructed condition of the mercury; all the advantages of the open cistern barometer being thus attained without the attendant difficulty of arranging the starting-point of measure. 3. The entire exclusion of air from the inner tube or cistern, and the consequent preservation of the surface of the mercury from oxidation. 4. The applicability of his new arrangement to barometers of any diameter, and with exclusive advantages obtained by no other mode. 5. The perfect security in carriage, when the barometer is either out of use, or required to be conveyed from place to place.—*Mechanics' Magazine*, No. 975.

THE WINDS AND THE BAROMETER.

ON May 12, were read to the Royal Society, some "Barometrical Observations, showing the effect of the Direction of the Wind on the Difference between distant Barometers," by Lieut.-Colonel Yorke.

The author institutes a comparison between the barometric heights as observed at the Royal Society, and at his house in Herefordshire, in the neighbourhood of Ross, with a view to ascertain the influence of prevailing winds on the atmospheric pressure. The barometers thus compared together were of the same construction, and by the same maker; and the times of observation, namely, nine o'clock A.M. and three o'clock P.M., were the same at both places; the distance between which is 110 miles in longitude, and about 20 in latitude. The degree of accordance in the march of the two barometers is exhibited by that of curves traced on three sheets accompanying the paper. The results are given in eight tables. The author agrees with Schubler in ascribing the currents prevailing in the atmosphere to the variable relations of heating and cooling which obtain between the Atlantic Ocean and the Continent of Europe at different seasons . the facts ascertained by the series of observations here presented being in accordance with that hypothesis. If the northerly and westerly winds in England be partly the effect of the expansion of the air on the Continent, then the barometer which is nearest to the Continent, or in this instance that at London, ought to be relatively more depressed than the other one more distant; or if the southerly and easterly winds be regarded as proceeding to the ocean, then, for a similar reason, the barometer nearest to the ocean ought to be relatively depressed; and that both these effects are produced, is shown by the tables. This view of the subject, also, the author remarks, is corroborated by Raymond's observations, detailed in his memoir on the determination of the height of Clermont Ferrand, from which it appears that with the north winds, the southern barometer was most depressed; while the reverse occurred with the southerly winds.

VITAL AIR.

ON June 6, was read to the Academy of Sciences, at Paris, a paper on the nature of the Air which we breathe, under various circumstances. The author, M. Leblanc, has directed his attention principally to an analysis of the air in rooms, hospitals, &c.,—in fact, in all situations wherever it is vitiated by the congregation of persons. He begins by showing, that the air of an empty room, the doors and windows of which are not closed, is precisely the same as that out of doors. This is, of course, natural; but he states, also, that he found the same to be the case with *closed* green-houses of the Jardin des Plantes; a seeming contradiction, which he explains by the absorption by the plants contained in them of the carbonic acid of the air, and the giving out again of this air purified by the plants which had absorbed it. But in one of the wards of the hospital of La Pitié, the doors and windows having been closed, the quantity of carbonic acid—that destructive element to human life—was found to be tripled, as compared with what it was before the room was closed; and, in one of the sleeping-rooms in the Salpetrière, the quantity of carbonic acid in the morning, the doors and windows having been closed during the night, was eight times greater than in the open air. In the great lecture-room of the Sorbonne, after a lecture of an hour and a half, one per cent. of oxygen had disappeared, and been replaced by one of carbonic acid. The quantity of carbonic acid in one of the *écoles d'asile*, of Paris, after it had been closed for three hours, whilst the pupils were taking their lessons, was found to be precisely the same as in the experiment at the Salpetrière. At the Chamber of Deputies, he found the quantity of carbonic acid vary from two to four parts in a thousand. The latter amount approaches the limit at which respiration becomes oppressive and injurious. In the latter portion of M. Leblanc's paper, he gives an account of some experiments with air deteriorated by the burning of charcoal.—*Athenæum*, No. 764.

CONSTITUTION OF THE ATMOSPHERE.

IN an elaborate investigation of the Constitution of the Atmosphere, by the late Mr. James Ivory, K.H., M.A., communicated to the *Philosophical Magazine*, we find the following results :—

"What has been demonstrated as necessary consequences of the physical properties of the gases agrees with the results of many laborious experiments undertaken for the purpose of resolving air into its constituent elements. Whatever be the local circumstances in which air is collected, it is found, on being analysed, to consist in volume of twenty-one parts of oxygen and seventy-nine parts of azote. This is true not only at the earth's surface, but on the tops of elevated mountains situated at great distances from one another, and even to the greatest height to which man has been able to ascend in the atmosphere, as is proved by the analysis of the air brought down by Gay-Lussac from a height of about 6400 yards.

"Another observation it is important to make. The law of Mariotte has been verified in the case of atmospheric air, between very wide limits of pressure and temperature : and, as it follows from what has been shown, that this law, and the formation of air by the combining of two gases in a constant proportion, are reciprocally consequences of one another, we have two independent experimental researches confirmatory of those co-existing properties of air. It appears, therefore, that there is good evidence to conclude that every portion of the atmosphere from the earth's surface to the top, is composed of two volumes of oxygen and azote in the proportion of twenty-one to seventy-nine, and that the law of Mariotte is applicable at all heights.

"The atmosphere, at any two points on the earth's surface, being composed of the same elements combined in the same proportion, can differ from one another only on account of the heat derived from the earth or from other sources. The effect of such heat is not to alter the aërial fluid in its constitution, but merely to dilate it, and to vary the height at which a given temperature will prevail in the column of air. It is, therefore, necessary to investigate the law according to which the heat decreases in ascending, in order to complete our knowledge of the atmosphere. Little progress has been made in this research. The measurement of small heights leads to results that cannot be depended on ; because a minute error of the thermometer is accompanied with a great variation of the elevation. Even in great heights, the discrepancies are so great as to warrant no more than this approximate conclusion, that the decrease of heat near the earth's surface is proportional to the increase of elevation. By careful experiments, the rate of the decrease of heat at any place, that is, the height required for depressing the thermometer 1°, may be ascertained with considerable accuracy; and it has been found that this imperfect element is sufficient for solving the two chief chief problems relating to the atmosphere, namely, the measuring of heights by the barometer, and the astronomical refractions."

TRANSPARENCY OF THE ATMOSPHERE.

ON May 26 and June 2, was read to the Royal Society, a paper "On the Transparency of the Atmosphere, and the Law of extinction of the Solar Rays in passing through it," by James D. Forbes, Esq. From the facts and reasonings of this paper, the author deduces, on the whole, the following conclusions:—The absorption of the solar rays by the strata of air to which we have immediate access is considerable in amount for even moderate thicknesses. The diurnal curve of solar intensity has, even in its most normal state, several inflections; and its character depends materially on the elevation of the point of observation. The approximations to the value of extra-atmospheric radiation, on the hypothesis of a geometrical diminution of intensity, are inaccurate. The tendency to absorption through increasing thickness of air is a diminishing one; and, in point of fact, the absorption almost certainly reaches a limit beyond which no further loss will take place by an increased thickness of similar atmospheric ingredients. The residual heat, tested by the absorption into a blue liquor, may amount to between half and a third of that which reaches the surface of the earth after a vertical transmission through a clear atmosphere. The law of absorption in a clear and dry atmosphere, equivalent to between one and four thicknesses of the mass of air traversed vertically, may be represented, within those limits, by an intensity diminishing in a geometrical progression, having for its limit the value already mentioned. Hence, the amount of vertical transmission has always hitherto been greatly overrated; or the value of extra-atmospheric solar radiation greatly underrated. The value of extra-atmospheric solar radiation, on the hypothesis of the above law being generally true, is 73° of the actinometer marked B 2. The limiting value of the solar radiations, after passing through an *indefinite* atmospheric thickness, is 15°.2. The absorption in passing through a vertical atmosphere of 760 millimetres of mercury is such as to reduce the incident heat from 1 to 0.534. The physical cause of this law of absorption appears to be the non-homogeneity of the incident rays of heat, which, parting with their more absorbable elements, become continually more persistent in their character, as Lambert and others have shown to take place, when plates of glass are interposed between a source of heat and a thermometer.

VARIATIONS OF ATMOSPHERIC TEMPERATURE.

Professor Marcet, from "Researches on the Variations which take place at certain periods of the day in the Temperature of the Lower Strata of the Atmosphere," has arrived at the following conclusions:—

1st. The increase of temperature in successive strata of the atmosphere, as we ascend, and which is remarked at the time of sunset, however variable it may be either in regard to its intensity or limit in reference to elevation, is a constant phenomenon in every state of the sky, except in the case of violent winds.

2d. The time of the *maximum* of this increase is immediately after sunset; from that moment it is stationary, or even pretty frequently diminishes, particularly when the dew is plentiful. At sunrise, the increase is, for the most part, not so considerable as at sunset.

3d. The limit of elevation to which this increase of temperature extends, seems rarely to surpass the height of 100 or 110 feet, even when the sky is perfectly clear and calm. When the weather is cloudy or windy, and pretty frequently in winter, even when it is clear and calm, this limit appears to be less elevated.

4th. The increase of temperature, ascending, varies both in regard to its intensity and its limit in elevation, according to the different seasons of the year. It is in winter, and particulary when the ground is covered with snow, that this phenomenon presents the most remarkable results.—*Memoires de la Société de Physique et d'Histoire Naturelle de Genève*, tom. viii. 2me partie: *Jameson's Journal*, No. 63.

MEAN PRESSURE OF THE ATMOSPHERE IN DIFFERENT LATITUDES.

Mr. W. Brown, jun., in a paper "On the Differences of the mean Pressure of the Atmosphere on different Latitudes," concludes that "between 40° and 30° of latitude, a uniformly accelerating force of 0·051 per second, to which the air is subjected in a direction from the pole towards the equator, predominates over the contrary forces; whilst, between latitudes 30° and 20°, a force of 0·042 foot per second is unequal to them, and between latitudes 60° and 70° the same degree of force is overcome; and between 50° and 60° the force equal to that between 40° and 30°, viz. 0·51 foot, is again predominant, although in the former regions the difference of height is much greater than in the latter; showing that those causes which tend to counteract the centrifugal force are much modified in different zones, as must evidently be the case by such circumstances as the relative proportions of easterly and westerly winds; an easterly wind being, we may suppose, when flowing towards the equator, in some parts of its course an ascending current, and therefore tending to check the upper current by the velocity acquired by its motion in the contrary direction; thus coinciding in its effects with the centrifugal force, or if there be no ascending movement, at least not opposing it;—an opinion which is in accordance with the fact generally mentioned by navigators, that westerly winds prevail in much greater degree between latitudes

30° and 50°, than between 50° and 65°, where the increase in the height of the barometer towards the equator is the greatest, the greater rate of increase being probably occasioned by the greater proportion of easterly winds" For further details, see Mr Brown's communication in the *Philosophical Magazine*, No 133

TROPICAL MIASMATA

PROFESSOR GUSTAV BISCHOF, of Bonn, has addressed a letter to the Editor of the *Friend of Africa*, in the investigation of Prof Daniell's "Analysis of the Waters of the African Coast and Rivers," inserted in the *Year Book of Facts*, p 107

Prof Bischof observes "In support of the supposition of Prof. Daniell, that the probability of a volcanic origin of the sulphuretted hydrogen is small, and that, on the contrary, its origin by the action of vegetable matter upon the saline contents of the water is extremely probable, I venture to call your attention to some experiments I made twelve years ago," and which are then quoted Prof Bischof, however, thinks it will be found that the sea water on the coast of Africa contains far less sulphuretted hydrogen than that analysed by Prof Daniell, and that this gas, for the most part, has been produced during the carriage of the waters to England Indeed, the vegetable matter found in different proportions in all those waters which contained sulphuretted hydrogen, seems to be the remaining part of what has been decomposed by the sulphates in them All such waters were bottled in the months of September, October, and November, 1839, but were not analysed before they had been in bottle above six months This space of time is, according to Prof Bischof's researches, more than sufficient to effect decompositions of sulphates by vegetable matters. Besides, according to the experiments of Prof Daniell, three months are alone sufficient to produce sulphuretted hydrogen, by adding a quantity of newly fallen leaves to water, in which sulphate of soda had been dissolved "The remark of this able chemist, (says Prof Bischof,) that this mixture had a most insupportable sickening odour, much more than pure sulphuretted hydrogen, is not to be overlooked, because it extremely favours the supposition suggested by me, that by the action of vegetable matters on sulphates, besides sulphuretted hydrogen, an organic substance is produced, which is by far more fatal to animal life than this gas"

In conclusion, Prof Bischof alludes to a particular decomposition of sulphuretted hydrogen, newly investigated by M Melloni, and reported in the *Comptes Rendus*, tom xi p 352 M Melloni found that a small piece of lighted tinder, or a lighted cigar, when placed near one of the *fumaroli*, in the Solfatara, near Naples, instantly produced a vapour, or a thick white cloud, and that this effect reached from 5 to 6 feet from the lighted substance M Payen having examined this remarkable phenomenon, found that sulphuretted hydrogen artificially prepared, and mixed with a large quantity of atmospheric air, is affected by lighted tinder, or by any lighted substance, in the same manner as that evolved in the Solfatara. The products of this effect are sulphureous acid, water, and a few traces of sulphur. Under these circumstances, the ingredients of sulphuretted hydrogen are consequently united with atmospheric oxygen, and form sulphureous acid and water M Payen has further detected that iron, and nearly all its natural compounds, as iron-glance, titaniferous oxydulated iron, even iron-pyrites, and lava—all, when heated, act precisely like lighted charcoal

It is evident, then, that a lighted cigar, an article fortunately common on board all ships, will, in some manner, counteract the noxious effects of sulphuretted hydrogen, when such is found to exist distributed through the atmospheric air

Prof Jamieson, in whose valuable *Journal* Prof Bischof's letter is quoted, adds the following note, corroborative of the views of the latter —" We are informed by letter from Dr Stanger, dated off the Niger, that Dr M'William, who has carefully examined the sea-water near the mouths of all the rivers from time to time, has not yet been able to find any trace of *sulphuretted hydrogen* in *freshly*-taken water, but when the waters had been kept a few days in corked bottles, it was twice very evident "

INSALUBRIOUS AIR

PROFESSOR PAUL SAVI of Pisa, from a series of " Considerations on the Insalubrity of the Air of the Maremma," in Tuscany, arrives at the following conclusions —

" It appears to be proved that places exposed to the effects of insalubrious air are—

1st Lands containing collections of stagnant and salt water, or lands which are not submerged, but which contain saline matters and organic substances, when watered by the rains of summer

2d Lands receiving mineral waters containing sulphates and chlorides, which rest upon decomposing organic matter

3d Shores on which masses of algæ accumulate, which are afterwards watered by fresh water, or by a mixture of fresh and salt water

As an hypothesis resulting from the facts observed, the author particularizes sulphuretted and carburetted hydrogen gases, if not as the direct agents of deleterious matter, yet contributing to the production of *malaria* —*Annales de Chimie et de Physique*, translated in the *Philosophical Magazine*, No 180, which see for the illustrative facts.

INFLUENCE OF LIGHT ON GASES IN STAGNANT WATERS.

MR A MORREN having occasion to analyse the water of many fountains and wells in the town of Angers, in France, as well as to analyse the gases they contain, has completed a series of " Researches on the influence which Light and the Green-coloured Organic substance often found in Stagnant Water exercise on the quality of the Gases contained in the latter "

In recapitulating the facts deduced from these experiments, the author thinks he has proved that, with the assistance of light, the green animalcules which live in stagnant water decompose the carbonic acid contained in it, and absorb its carbon, and that the oxygenated gas disengaged dissolves in the water in the state of a nascent gas.

The oxygenation of the water diminishes in proportion as we descend below the surface: thus, at 3 feet, the air of the water contained 43 parts in 100 of oxygen, while there were only 34 parts in 100 at the depth of 13 feet.

The maximum of oxygenation runs from 56 to 61 in 100, and takes place about 4 or 5 o'clock in the evening.

It was important to ascertain whether the green colour was indispensable to the existence of the property of decomposing the carbonic acid in the microscopic infusory animalcules living in stagnant water. After many fruitless researches, Mr. Morren at length succeeded in ascertaining the means of reproducing a great number of an animalcule of a fine purple colour, which he at first took for a *Protococcus nivalis*, but which he afterwards found to be nearly allied to *Trachelomonas volvocina* of Ehrenberg. He filled numerous bell glasses, containing from 8 to 10 *litres*, with filtered rain water. He then poured into each of them half a litre of water, well replenished with trachelomonas; and at the end of a month, all his vessels were shining with a magnificent reddish-purple colour.

He then had it in his power to repeat with these animalcules all the experiments he had made on the green ones, and he obtained results absolutely identical. Only the proportion of oxygen never exceeded at the maximum 47 per cent., instead of 61 obtained in the fish-pond; but it is easy to perceive that the artificial condition of life in which the trachelomonas were placed, may explain these differences. It is evident, therefore, that the green colour of the animalcules is not an indispensable element in the decomposition they cause of the carbonic acid contained in the water; that the phenomenon is reproduced with those of a red colour, and that it is probably also an attribute of animalcules of every colour and condition of existence. This constitutes another bond of connexion between the two great kingdoms of the organic creation, and a new and powerful agent in the purification of the atmosphere.—*Bibliothèque Universelle de Genève*, No. lxx.; *Jameson's Journal*, No. 63.

RAIN IN EGYPT.

We not unfrequently find it boldly asserted in the accounts given by travellers of the climate of Lower Egypt, that it does not rain at Cairo. This statement is untrue, and is one for which science has to thank the presumptuous conclusions formed by the ignorant or credulous. In Egypt and Nubia, there is no district devoid of rain—at least, for the natural philosopher; the peasants, it is true, not satisfied with a few drops, judge otherwise, and their ideas require much correction to bring them to the truth. There are, however, districts where it rains very rarely; and, even among these, Cairo, with its vicinity, is not to be reckoned, for, year after year, storms take place there during our winter months, which rarely pass away without rain.

Just as the years 1761 and 1762, in which Niebuhr made his observations at Cairo, undoubtedly belong to those which are remarkable for the quantity of atmospherical precipitations, and ought, therefore, to be included among the exceptions; so, on the other hand, there are years when these precipitations are particularly rare, and which, therefore, are also to be regarded as exceptions. We cannot employ either as a guide to enable us to deduce the mean yearly quantity of rain; and conclusions exclusively confined to the one or the other are hence incorrect.—*M. Joseph Russegger; Jameson's Journal*, No. 65.

WARMTH OF THE SNOW BLANKET.

At the French Academy of Sciences, (March 14,) M. Arago read a communication on the Warmth imparted to the earth by a covering of Snow, and respecting which there has hitherto been much scepticism. M. Arago stated that M. Boussingault had ascertained the truth of the theory beyond the possibility of doubt, during the past winter. He found that a thermometer plunged in snow to the depth of a decimetre (about 4 inches) sometimes marked 9 degrees of heat greater than at the surface.

NEW MUSICAL INSTRUMENT.

M. Isoard, an engineer in the establishment of Chaillot, (from long and laborious study of acoustics, from attending the lectures of M. Savart,) has deduced the possibility of impressing on a string powerful vibrations, so as to cause it to perform the part of the reed of a wind-instrument. This M. Isoard effects by placing under the strings a moveable case, divided into as many compartments as there are different strings to vibrate. Each compartment communicates with a common port-vent by means of a valve. The air, compressed by double bellows, is stored in a special magazine, and is admitted, at the proper time, into each compartment by means of opening the valve upon touching the key. The emission of the air, thus introduced for continuing and augmenting the vibration of the string, takes place through a longitudinal slit, in which the string may be inserted at will. We say intentionally, that the string struck by the air continues to vibrate; for, M. Isoard, like his predecessors, in 1790, has had to contend with the slowness with which certain strings communicate vibration; like them, he has triumphed over the obstacle, but by a very different means. The much more simple mechanism of the hammer which strikes the strings has been preferred by him to the very ingenious but very complicated apparatus which rubs the string, in order to cause its vibration to commence.

The choice of the hammer is happy, because it affords M. Isoard the real advantage of restoring to his strings their original sound: by lowering the moveable case, the string being struck when out of the slit where it receives the action of the air, emits only the sound of the piano. He can then, by means of a simple pedal, which raises or depresses the air-case at pleasure, suddenly change the nature of the sound of the instrument; and this power offers numerous resources for varying the musical effects. By dividing the air-case into several portions separately moveable, each including an octave, it would be easy to combine the two kinds of sounds: for example, the sound of the piano might be retained for the high strings, and that of the reeds given to the low strings, or *vice versâ.*—*Comptes Rendus*, vol. xiii. p. 969.

M. Isoard has arrived at these results after ten years' constant and expensive experiments, in the prosecution of which he has sacrificed every thing he had acquired by his labour as an engineer, and sold by piecemeal his furniture, and even his working tools. He has thus been barely enabled to submit his design to the Academy of Sciences, at Paris, who appointed a joint commission of their body and the Academy of the Fine Arts* to investigate the merits of the invention; and the preceding details are the substance of remarks by M. Seguier, the reporter.

ON CONCHYLIOMETRY.

PROFESSOR MOSELEY, in a paper printed in the *Transactions of the Royal Society*, (1838, Part. ii.†,) has investigated certain properties of the spiral curves traced upon the surfaces of shells, (concho-spirals,) common to them and to the well-known logarithmic spiral.

The results deduced from his admeasurements have since been confirmed by those of Professor Naumann, of Freisberg, (Poggendorff's *Journal*, 1840,) who has developed, by an independent investigation, several new properties of these curves; and has determined, with his accustomed accuracy, in respect to an extensive series of conchyla, the particular value of the constant angle according to which each traces its concho-spiral.

With a view to the further development of the geometrical properties of shells, Prof. Moseley has, in his paper above referred to, investigated certain formulæ representing the equation to the concho-spiral, the volume of a conchoidal solid, the position of its centre gravity, and the area of a considerable surface. In a paper in the *Philosophical Magazine*, No. 138, Prof. Moseley has continued these researches in respect to concho-spirals and conchoidal surfaces, and, in some particulars, corrected them.

CREAM AND BUTTER.

THE Viscount de Romanet, in treating on the phenomena presented in the transformation of Cream into Butter, states, from microscopic observation, that the cream consists of the globules of the milk, which rise to the surface from their lightness, and which contain the butter in the form of pulp, enveloped in a white, thin, and elastic pellicle. The action of the churn is, he says, nothing more than the rupture of the pellicle, and it is the fragments of this pellicle which whiten the liquid called butter-milk; the acidity which manifests itself in this liquid, at the instant when the butter is formed, is due to the immediate contact of the butter with the acid principles of the milk.—*Athenæum*, No. 758.

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* This Commission consisted of the following distinguished individuals:—MM. Cherubini, Berton, Halévy, Carafa, and Spontini, of the Academy of the Fine Arts; and MM. Arago, Puissant, Becquerel, Dutrochet, Poncelet, and Seguier, of the Academy of Sciences.

† See "Geometry of Shells," in the Year-Book of Facts, 1840, p. 189.

MOTION OF CAMPHOR IN WATER.

On June 27, M. Dutrochet read to the Academy of Sciences, at Paris, the result of his further observations on the motive power exerted on the surface of several liquids, as much by the influence of the vapour of certain substances as by their immediate contact. It is known that light bodies placed on the surface of water or of mercury are repelled to a distance by the vapour of camphor, of alcohol, of ether, of essential oils, &c. This phenomenon is generally attributed to the impulse which results from the rapid expansion of the vapour, which blows on the light body, and thus determines its dispersion. M. Dutrochet's observations do not allow this explanation; since this repulsion can at will be, by certain conditions, changed into attraction. He attributes the motion to a modification of the capillary force, which he calls the *epipolic* force.—*Literary Gazette*, No. 1329. *

LIGHT DURING CRYSTALLIZATION.

By fusing a mixture of one equivalent each of sulphate of potash and soda in a platina crucible, M. H. Rose has obtained a vitreous mass, devoid of crystalline texture. This was dissolved in boiling water, and the solution quickly filtered, and allowed to cool slowly in the dark; it exhibited the same appearance of light as was observed by M. Rose in 1836, during the crystallization of a solution of vitreous arsenious acid in hydrochloric acid: the formation of each rudiment of a crystal was announced by a spark. The crystals thus obtained exhibit nothing similar when redissolved; but if crystals which have been formed with the disengagement of light be taken from the solution, they become again phosphorescent when strongly rubbed or pressed; they do not retain this property for more than a few hours, and have the usual crystalline form of the salt.

No phosphorescence occurs during the crystallization of the sulphate of potash, when the vitreous mass is dissolved more than 24 hours after its fusion; it appears then to have passed to the crystalline state. The crystals deposited with phosphorescence are not formed of pure sulphate of potash; they are a true double salt, which possesses the same crystalline form as sulphate of potash, and most of its physical properties. M. Rose found in several experiments a double salt formed of 2 atoms of sulphate of potash and 1 atom of sulphate of soda; in other cases, on the contrary, the proportions were 3 atoms of sulphate of potash and 2 atoms of sulphate of soda.

The phenomenon of phosphorescence, in the case of the double sulphate of potash and soda, appears to depend on its vitreous state, which it retains in solution, and passes to the crystalline state at the moment only of its separation from solution.

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* For a contrary opinion, by M. Dutrochet, see Year-Book of Facts, 1842, p. 129.

M. Rose has found, by a great number of analyses, that the sulphate of potash of commerce contains sulphate of soda, forming with it a double salt, in which, contrary to what usually happens, the potash is isomorphous with soda.

The double sulphate of potash and soda is produced, not only by fusing the two mixed sulphates, but by fusing sulphate of potash with chloride of sodium, or carbonate of soda, or chloride of potassium with sulphate of soda.

Equivalents of neutral chromate of potash and anhydrous sulphate of soda exhibited after fusion the same phenomena as the compound of the two sulphates; the crystals formed were composed of the two acids and two bases.

The double chromate of potash and soda, free from sulphate, exhibits very lively phosphorescence; and so also does the seleniate of potash and soda.

The light which appears during the crystallization of certain bodies, is due, as proved by the foregoing statements, in the opinion of the author, to the passage of a salt from one state to another isomeric with it. These transitions are very often accompanied with phenomena, which appear of the same nature as phosphorescence, during the crystallization of some salts: among the most common may be cited the sudden incandescence of oxide of chromium, titanic acid, &c.—*Journal de Pharm. et de Chim.; Philosophical Magazine*, No. 131.

INUNDATION OF THE NILE.

The rising of the Nile is merely a consequence of the tropical rainy period, and that not merely in so far as regards Abyssinia, but also in so far as relates to all the countries which send their waters to the river district of the Nile, and its two great branches, the Blue and the White Rivers. Neither the melting of the snow, nor the falling of it on the high mountains of Abyssinia, comes here into consideration; for the snow is of no consequence whatever, and its operation on the height of the Nile one of those illusions called forth by absurd hypotheses, which one person after another repeats, sometimes during whole centuries, with all the accompaniments of pedantry. Whoever has witnessed one or several rainy periods of the interior of the tropical regions of Africa can very well understand their influence on the rising of the river.—*M. Joseph Russegger; Jameson's Journal*, No. 65.

ACTION OF LIGHT ON REVOLVING DISCS.

Mr. Milward, in some observations on this interesting inquiry, communicated by him to the *Philosophical Magazine*, No. 133, illustrates the subject by the following experiments:—

First, is a beautiful result of Professor Wheatstone's exertions connected with this subject. The light is afforded by means of an extended wire of considerable length, from interruptions in which sparks are emitted. Immediately opposite, this is placed a circular disc obliquely inclined to its axis, so that no two of its positions are in the same place, and two successive rays of light will be reflected in different lines. Hence it is evident, that unless the sparks emitted from the parts of the wire be separated by so indefinitely small an interval of time, the wheel cannot in that time move through an appreciable space; the light thus falling on the disc will be reflected in different directions, and thus we have a test of the utmost delicacy.

It has been suggested that this experiment may be applied to the purpose of measuring the velocity, and with much greater chance of success than any previously mentioned by Mr. Milward; for, if the light be reflected from the disc upon a screen, the space between the projection of the rays upon it may be measured; and since the position of the screen with relation to the disc is known, we may calculate the angle of revolution actually passed through by the latter. If, therefore, the velocity of the wheel be known, the exceedingly short period in which it passes through the angle just determined may be likewise calculated; and it is evident that this is the period required by the electric fluid for its passage along the wire, by which means the velocity will be determined.

Next is an experiment of a very beautiful description, and which Mr. Milward saw performed by Mr. Janson, of Pennsylvania; when, from the concealed nature of the cause, it appeared at first sight almost inexplicable. It consists in illuminating a rapidly revolving disc by means of the light emitted in the circuit of Clarke's magnetic electrical machine, when a singular effect is produced, which varies according to the velocity with which the wheel is turned. The two velocities may be so adjusted, that the disc, though in rapid revolution, appears to be absolutely at rest, and its surface distinctly visible. By decreasing its velocity, the disc appears to move slowly *forward;* while by increasing it, a *retrograde* movement appears to take place.

The cause of this depends entirely upon the nature of the light. When the machine moves slowly, we perceive that a succession of sparks is emitted at the surface of the mercury; but, as the velocity becomes greater, the light appears continuous, in consequence of the duration of the effect upon the retina; and here, as in the experiment previously mentioned, the disc acts as a test, when the unassisted powers of vision are incapable of appreciating the interval between the sparks.

Let us first consider the case in which the disc appears stationary. By referring to our previous principle, that a spark of very short duration produces a clear image of the disc, as reflecting only one *m*th position, we may consider the effects produced by a succession of such sparks, the intervals between which are definite and equal; and here it is evident that each spark reflects an image to the eye which will be separated from that which succeeds it by the space through which the wheel passes during the elapsed interval.* Now, if this interval be exactly equal to the interval in which the disc performs an entire revolution, it is evident that each spark, as it is produced, will reflect the same image to the eye, and always in an identical position, so that the disc must appear stationary Thus, in the first case, the phenomenon arises from the interval between the spark being exactly equal to the time in which the wheel revolves In the second case, it is clear, that if during the interval between the sparks, the disc describe a space exceeding the revolution by a very small quantity, each spark will reflect to the eye the image of a position slightly in advance of the preceding, and thus the effect will be that of a disc, which in place of revolving equally, is seen only in successive positions, separated by the small quantity above mentioned, and the interval between which will be equal to the lapse of time between the successive sparks The cause of its distinctness depends not only upon the principles which influence a disc in slow motion, viz, the small number of *m*th positions contained in a group, by which the range of confusion is decreased, and also the disturbing effect of the optic muscles, by which the eye spontaneously follows the revolving image,—but also upon the advantage of the length of time elapsing between the sparks, (and therefore between the formation of the images,) which permits the effect of the last image to decrease in intensity before its place is supplied by another, thus diminishing the confusion So, in the second case, the velocity of the wheel being greater than the interval between the sparks, the effect becomes that of a slowly revolving wheel, whose motion is direct

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* Mr. Milward speaks here of only one revolution, but it is evident that the phenomenon will be the same if the wheel perform two or more revolutions in the interval between the sparks: so also in the other cases.

By the same reasoning it is evident, that if the time of revolution be slightly greater than the interval between the sparks, the space described will fall short of a revolution by a very small quantity, whilst the effect will be the same as in the second case, except that the motion will be retrograde, and the interval of time between the occurrence of the positions will be diminished by the time of describing the small quantity just mentioned, instead of increased thereby

It is clear from the nature of the phenomenon, that unless the excess or deficiency be very small, the continuous image will not be distinct, but will have a flickering and irregular appearance

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NEW OPTICAL RESEARCHES

SIR DAVID BREWSTER has read to the British Association, the three following communications —1 "On Luminous Lines in certain flames corresponding to the defective lines in the Sun's light," 2 "On the Structure of a part of the Solar Spectrum, hitherto unexamined," and 3 "On the Luminous Bands in the Spectra of various flames"

I. After noticing Fraunhofer's beautiful discovery as to the phenomena of the Line D in the prismatic spectrum, Sir D Brewster said, he had received from Munich a splendid prism made for the British Association, one of the largest perhaps ever made, and, upon examining by it the spectrum of deflagrating nitre, he was surprised to find the red ray, discovered by Mr. Fox Talbot, accompanied by several other rays, and that this extreme red ray occupied the place of the line A in Fraunhofer's spectrum; and equally surprised to see a luminous line corresponding with the line B of Fraunhofer. In fact, all the black lines of Fraunhofer were depicted in the spectrum in brilliant red light. The lines A and B turned out in the spectrum of deflagrating nitre to be both double lines, and upon examining a solar spectrum under favourable circumstances, he found bands corresponding to these double lines There was no light whatever in the solar spectrum corresponding to the luminous rays produced by the deflagration of nitre What was the cause of this want of coincidence it was very difficult to say, but the probability was, that the analogy extended over the whole range. He had looked with great anxiety to see if there was any thing analogous in other flames, and it would appear that this was a property which belonged to almost every flame.

2. Sir David Brewster had, by means of the prism from Munich, been enabled to extend the solar spectrum from the point where, according to Fraunhofer, it terminated he found one part to consist of about 16 lines, placed so near to each other that it was difficult to recognise the separation; but the lines, as they approached to Fraunhofer's A, were much nearer to each other than as they receded from it; consequently, the whole of that portion of the spectrum appeared concave, resembling so much the scooped-out lines of a moulding on wood, that it was scarcely possible to suppose that the beholder was not looking at such a moulding Sir D B was led to observe an analogous structure near the line B, or the extremity of the additional spectrum, and upon carrying on this comparison of structure of one part of the spectrum with that of another, it seemed to him that by and by something important would result, for there was a repetition of a group of lines, and similar lines, through different parts of the spectrum, as if the same cause which produced them in one part produced them in another

3. Sir David Brewster had endeavoured to procure all the minerals and artificial salts and other combustible substances which could be obtained, and, in order to have a suitable combination, he used an oxygen light analogous to the Bude light Every one conducting these experiments was aware that it was necessary to pass the light through a narrow aperture, but this would reduce the intensity of the light so much, as to make it difficult to observe the rays at the extremity of the spectrum; and he found that he could obtain the effect of a small aperture by merely inclining the prism; so that, with a good prism, the great lines in the solar spectrum might be seen by using an aperture three or four feet wide, the whole breadth of the window, by the mere inclination of the prism, which had the effect of producing a narrowing, facing the light. He had obtained 200 or 300 results, which he had not had leisure to group; but he would mention some of the general results When nitrate of lead was thrown into combustion, remarkably fine lines were produced in the spectrum. The luminous line, D, of Fraunhofer, existed in almost

every substance, especially in all into which soda entered, particularly in the flame of a common candle, probably, owing to the muriate of soda existing in the tallow. The hydrates of strontytes gave the lines very remarkable in yellow and green. The iodide of mercury did the same. Also, in that remarkable substance, the litheoxanthemate of ammonia, first discovered and published by Mr. Fox Talbot, the fine lines were seen throughout the whole length of the spectrum; and there was a remarkable blue band, which he (Sir D. Brewster) had not distinctly recognised in any other flame. Indigo gave fine green and orange lines at equal distances from the D of Fraunhofer; Prussian blue did the same, calomel, nitrate of magnesia, litharge, also showed lines, the sulpho-cyanite of potash gave a violet and orange flame, with the lines extremely distinct.

Sir W. Hamilton considered these optical researches to give definite characters to things, which it would be necessary to include in any new history of chemical compounds Mr. Fox Talbot observed that nothing was more extraordinary than the first fact discovered by Fraunhofer, that the double ray produced in most flames, especially when soda was in combustion, should answer exactly to the double black line in the solar spectrum. This was one of the most unintelligible things in natural philosophy —*Athenæum*, No 766.

THIRD NEUTRAL POINT.

Sir David Brewster has, by a series of observations very difficult to make, owing to the overpowering light of the sun, discovered a *Third* Neutral Point about 10° or 12° below the sun when at a mean altitude, receding from the sun when he was nearer the horizon, and approaching to his disc at higher altitudes. He states also, that an analogous neutral point would be seen *below* the anti-solar point; but that it could not be seen, as the sun's light reflected from the atmosphere became too feeble, before the neutral point in question rose above the horizon. Sir David has also discovered secondary neutral points, which accompanied the primary ones when near the horizon

This interesting phenomenon is best seen when the most distinct neutral point, viz, that of M Arago, rises above the horizon before sunset, and when the horizon is bounded by the sea The negative polarisation below the primary neutral point is counteracted by a cause near the horizon producing positive polarisation, and at the horizon itself positive polarisation exists. The arch of negative polarisation between the primary and secondary neutral points is sometimes 8° or 10°. By means of the polariscope alone, the position of the neutral points, both primary and secondary, were observed; and the degree of polarisation was ascertained by compensating it, or destroying it, by the opposite action of a bundle of glass-plates, or by one or more reflections from black glass, the compensation being indicated by a neutral line where the polarised bands are interrupted, and pass into the complementary bands. The compensating polarisation is varied by varying the angle of incidence, or the number of the plates, or the angle which the plane of incidence on the plates forms with the plane of polarisation of the part of the atmosphere observed. Sir D. Brewster prefers the tourmaline to a Nicol's prism for the analysing part of the polariscope. Whenever the polarisation of the atmosphere was very weak in fine clear weather, it was owing to the presence of a white nebulous matter, which was visible only in its effect, viz., by diminishing or diluting the blue colour of the sky. The polarisation was always, *cæteris paribus*, a maximum about 88° or 90° from the sun, and in a plane passing through the zenith; the polarisation being least in the horizon, unless in those cases where the nebulous matter was collected at higher altitudes.—*Editor of the Literary Gazette;* No. 1331.

NEW POINT IN OPTICAL METEOROLOGY.

On July 12, M. Babinet read to the Academy of Sciences, at Paris, a paper "On a New Point in Optical Meteorology." The existence of this second neutral point has been verified by several naturalists, and especially by M. Forbes. M. Babinet intended to have observed, during the eclipse on the 8th of July, whether the unequal illumination of the atmosphere during partial occultation would have moved the neutral point of Arago out of the vertical, opposed to the sun when he had risen a little above the horizon; but the unfavourable state of the heavens prevented him fulfilling his intent. In preparing for his observation, however, on the evening of the 3d, the atmosphere being extremely clear, M. Babinet noticed, that, after the setting of the sun, the neutral point opposed to that luminary rose considerably, whilst the neutral point above the sun fell sensibly, but much less than the other mounted; thus exhibiting a displacement unequal and in an inverse ratio of the neutral points. —*Literary Gazette*, No. 1331.

NEW PROPERTY OF THE SPECTRUM.

Sir David Brewster has made to the British Association a communication "On a new Property of the Rays of the Spectrum, with Observations on the Explanation of it given by the Astronomer-Royal, on the principles of the Undulatory Theory." If we cover half the pupil of the eye with a thin plate of any transparent body, and thus view a prismatic spectrum, so that the rays which pass by the plate interfere with those which pass through it, the spectrum is seen crossed with beautiful black and nearly equidistant bands, whose breadth, generally speaking, increases with the thinness of the plate. If the edge dividing the ray were directed to the red end of the spectrum, then fringes were seen; but no such fringes appeared when it was turned to the violet end of the spectrum. One peculiarity of these fringes, not before noticed, was, that they had not the forms of bands, but rather the appearance of screws, or dotted black lines, or as if they were formed by the shadow of a plate of metal perforated by small openings. This, which appeared to be a new property of light, and to indicate a polarity in the simple rays of light, when separated from each other by refraction, he had commented on at the meetings of the Association at Liverpool and Bristol, and Mr Airy, the Astronomer-Royal, had given a paper and two publications on the subject, in which he endeavoured to account for this upon the undulatory theory, arguing that the appearance and magnitude of the fringe depended upon the diameter of the pupil, or of the object glass Sir D Brewster said, he had repeated all his experiments under every variety of form, varying the diameter of the pupil from its greatest expansion to its greatest contraction, and the diameter of the object-glass from four inches to a quarter of an inch, when the fringe remained utterly unaffected by these variations He further found, that these fringes varied in magnitude with the distance of the eye from the refracting body, and not with the magnitude of the pupil He stated several other results, all of which, he thought, could not be explained on the principles of the undulatory theory

In the discussion which followed, Sir John Herschel did not consider that the preceding experiments should, at present, lead to the abandonment of the undulatory theory Sir John proceeded to observe that "the facts just brought forward by Sir D Brewster were most extraordinary, and deserved the deepest consideration, but it was necessary to suspend our judgment until further inquiry, and perhaps new facts, threw more light on this very difficult subject, The screw-like appearance and dotted lines described by Sir D Brewster, appeared to be one of the most extraordinary facts connected with the spectrum But the spectrum might be said to be a world within itself, of which we know as nothing, compared with what remained to be known"—*Abridged from the Athenæum*, No 769, *Literary Gazette*, No 1332

EHRENBERG ON THE DUST OF DIAMONDS

FROM experiments he has made on the dust of diamonds, he has found that a diamond superficies of $\frac{1}{100}$th of a line in diameter presents a much more vivid light to the naked eye than one of quicksilver of the same diameter He has not been able to find smaller particles of diamond dust possessing a good lustre The smallest particles were from $\frac{1}{1000}$th to $\frac{1}{1500}$th of a line in diameter but even under the microscope no lustre was to be perceived This, perhaps, was owing to the treatment The result arrived at is, that fluid metals, since a small part only of their globular superficies shines strongly, make perceptible only very small particles of light, that in proportion much smaller lamina, especially diamond lamina, may be at last as easily discerned as considerably larger metallic globules Whether the proportion is as 1 to 3, further investigations must teach us Particles of light having a linear form constitute the utmost limit of the power of vision, and the luminous or light reflecting corpuscles are the fixed stars of the microscopic world —*Poggendorff's Annalen translated in Taylor's Scientific Memoirs*, Vol i p 583

EHRENBERG ON IRIDISCENCE.

The causes producing natural iridiscence under the microscope may be reduced to the three following heads :—1. The presence of thin irisdiscent plates. 2. Of sharp and delicate striation of surface. 3. Of minute symmetrically placed pores. This phenomenon is distinguishable from any chromatic colouring arising from the microscope itself, by its becoming less intense the more the magnifying powers of the instrument are increased.

EHRENBERG ON THE PERCEPTION OF THE SMALLEST BRIGHT BODIES.

On pressing small globules of quicksilver on a glass micrometer, he easily obtained smaller globules of $\frac{1}{100}$th to $\frac{1}{8000}$th of a line in diameter. In the sunshine, he could only discern the reflection of light, and the existence of such globules as were $\frac{1}{800}$th of a line in diameter with the naked eye; smaller ones did not affect his eye, either in sunshine or with a Chevalier's reverberatory lamp. He however remarked, at the same time, that the actual bright part of the globule did not amount to more than $\frac{1}{800}$th of a line in diameter. Spider-threads of $\frac{1}{2000}'''$ in diameter were still discernible from their lustre.—*Poggendorff's Annalen, translated in Taylor's Scientific Memoirs*, Vol. i. p. 583.

EHRENBERG ON THE POWER OF VISION IN THE HUMAN EYE, &c.

He concludes that there are, putting aside all inorganic bodies, even in the kingdom of organic bodies, whose constituent parts or molecules are generally considered to be the coarsest, magnitudes capable of direct proof, which are in diameter $\frac{1}{18040}$ of a line; and others that can be proved indirectly, which may be less than a six-millionth part of a Parisian line in diameter; that the ideas often expressed respecting atoms, as subjects of experience, are somewhat too confident; finally, that the power of the microscopes, which we at present possess, does not in its maximum amount to more than to make distinctly visible long opaque threads of $\frac{1}{120000}'''$ diameter, and square superficies or globules of $\frac{1}{144000}$ of a line in diameter; and that for these latter they must be increased forty times, in order to satisfy what is required for reaching directly those minutest *parts of organic bodies*, whose existence has been inferred from simple deductions; and that we are not to entertain a thought of perceptible, or ever attainable simple matter, or material primitive constituent particles.—*Poggendorff's Annalen, translated in Taylor's Scientific Memoirs*, Vol. i. p. 528.

IMPROVEMENT OF THE TELESCOPE.

Mr. Fox Talbot has read to the British Association a paper on this important subject. The Improvement of the Telescope appeared to Mr. Talbot a subject of promise two years ago, when he first heard of the success of the Earl of Rosse in casting large specula. Mr. Talbot conceived that if, as in the case of the Oxmantown, a perfect large speculum were once obtained, it might be multiplied by the electrotype The copies, perhaps, may not be quite so perfect as the original, yet they may be sufficiently accurate to be fine and important instruments

The first great and obvious difficulty of the electrotype was with regard to the metal generally employed Copper reflects light badly, and therefore was not suitable for a speculum Mr Talbot devised a method to overcome this difficulty In the meantime, Professor Wheatstone had been also engaged in similar investigations The idea of the several white metals, platinum, palladium, nickel, silver, &c had occurred to both and Prof Wheatstone had preferred platinum, which he employed for the purpose by precipitation, and had obtained a reflector of sufficient polish and power Mr Talbot's especial thought was, whether the surface of copper might not be whitened and thus a better reflecting surface obtained He employed hyposulphuret of ammonia, which does turn copper white, and moreover conquers two evils—the deficient reflecting power, and the readily tarnishable surface For, in fact, in the latter respect the copper is changed into a sulphuret, a stronger chemical compound than an oxide of copper, wherefore it would not be acted on by the oxygen of the atmosphere

About a year ago, when Mr Talbot was at Munich, Professor Steinheil showed him what he considered a great novelty, namely, a method of making specula by means of the electrotype Thus had the same notion occurred, and been practically carried out, by three eminent persons The realisation by Prof Steinheil was the precipitation of gold on a given speculum of copper Mr Talbot had thought gold would not be capable of reflecting sufficient light It does, however, reflect more light than polished steel, and Mr Talbot had witnessed in a Gregorian telescope, commonly gilt, well-defined objects, although slightly tinged with yellow The idea of Professor Steinheil, not only of the copying specula, but also other parts of the telescope, by the electrotype, had been much approved by German astronomers In order to produce a fine gold surface, with copper back, by the electrotype, Prof Steinheil had adopted a very ingenious and novel process First, from the pure cyanide of gold was thrown down a gold film or coating to the required thickness, then the cyanide of copper, in certain proportions, was mixed with the salt of gold, and both precipitated as an alloy, and then, increasing the salt of the less noble metal by degrees, a back of pure copper was obtained, with perfect adhesion throughout The principal novelty of this is the two metals going down together, for hitherto the belief has been, that each would have passed over to the negative pole singly, in the order of their electric states

But the large specula being thus easily and cheaply procured, the question remains, how the telescope, with requisite gigantic framework, may be used Professor Steinheil s plan was, to have the tube of a speculum, of 60 or 80 feet focal length, fixed in an invariable position, and pointing to the pole of the heavens, to have a plane mirror larger than the speculum placed over the axis revolving, to transmit the heavenly object to the parabolic reflector, and thence to the spectator. Other mechanical arrangements of a similar kind were proposed.

Mr. Holden said, that Lord Stanhope had invented and erected a telescope on the plan, (as to the fixity of the framework,) which Mr. Talbot recommended. The instrument was stationary, and he could sit still and view more than one-half of the heavens, taking in even 20° behind his head, by means of an arrangement of mirrors.

Sir D Brewster mentioned a similar plan, proposed twenty years ago by an American gentleman to the Royal Society of Edinburgh. There the mirror was not vertical, like Lord Stanhope's, but horizontal, consisting of a dish of metal in which a quantity of mercury was placed, and a rotatory motion was given to the disc, so that the mirror assumed a concave form, giving a parabolic surface, of the actual form required to reflect bodies, by which means a mirror was constructed in one instant of time This appeared so impracticable to the Society, that they did not venture to give any account of it in their Memoirs, but now we saw something analogous to it. He thought the advantage would be greatly increased if, in place of the gold, a silver surface could be deposited, as it reflected nearly one-third more than gold. The reason why gold reflected more light than steel was, because its refractive power was greater. The difficulty of making a surface of silver would, he thought, be found considerable in practice, but some method might be discovered of removing the difficulty. A gentleman in Ireland had communicated to him a scheme for coating porcelain with platina similar to those vessels in ordinary use which had a metallic aspect. That attempt, he understood, was not successful, but the method seemed to be one which might be rendered useful by further experiments

Sir W Hamilton said, that one of the peculiarities of Lord Rosse's plan was, that he thought nothing of unpolishing a mirror in the morning, and having it ready for use again in the evening —*Literary Gazette*, No 1330.

NEW SYSTEM OF EYE PIECES.

Professor Gonnella has presented to the Scientific Congress, held at Florence in 1841, a theory of new systems of Eye-pieces of arbitrary lengths for the Newtonian telescope, and for spherical as well as parabolic object-glasses, according as is best suited for artists. In reducing for each telescope the length of the tubes of the eye-pieces greater than the semi-diameter of the object-glass, we may substitute for the small plane metallic mirror a rectangular prism of glass, very small, whatever may be the opening of the object-glass, since the prism may be placed very near the focus without the eye of the observer being of necessity within the great tube, for the length of the eye-piece determines the place of the eye on the outside of this same tube. We thus obtain the power of constructing the best telescopes, with the prism, as pointed out by Newton, of large dimensions, for that prism being very small, we may,—1st, easily find pieces of perfect glass for them; 2nd, we may have the total reflexion of the rays, since the quantity of light absorbed by the thickness of the prism is insensible; 3rd, we may obtain the advantage that the loss of the central rays of the object-glass, intercepted by the prism, shall be very small in relation to the diameter of the object-glass, and always smaller relative to the greatest diameters; for the size of the prism is always constant for all the object-glasses, viz. about an inch for each side of the right angle of the rectangular triangle which forms its base. In short, it only remains for us to observe, that the telescopes with the prism have double the clearness of those which have the small plane metallic mirror. —*Communicated by Mr. Babbage to the Philosophical Magazine*, No. 128.

POWERFUL MICROSCOPE.

Mr. Carey has constructed for the Polytechnic Institution a new Oxyhydrogen Microscope, consisting of six powers, ranging from 130 times to 74,000,000 times. The second power magnifies the wings of the locust to 27 feet in length. The fourth power magnifies the sting of the bee to 27 feet. By the sixth power the eye of the fly containing 750 lenses, is so magnified that each lens appears to be 11 inches in diameter; the human hair is magnified to 18 inches in diameter. The diameter of the condensing lens is 9½ inches.

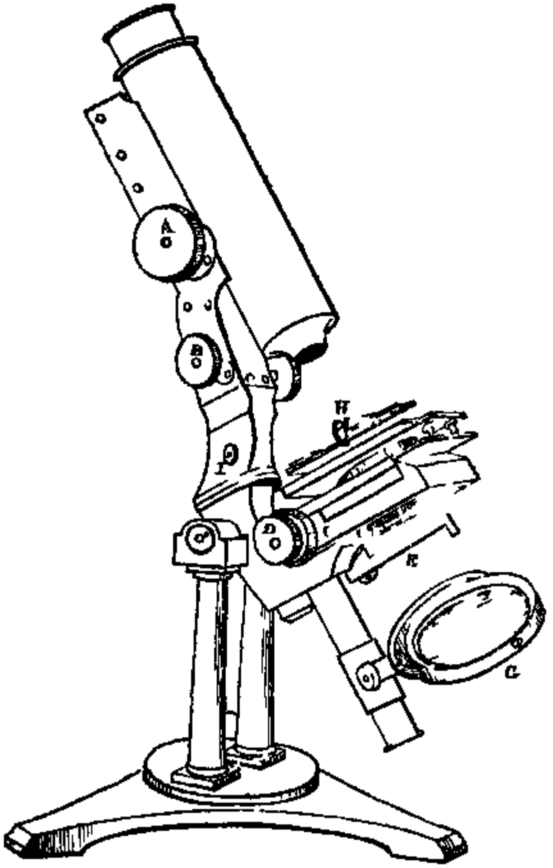
NEWLY-CONSTRUCTED ACHROMATIC MICROSCOPE.

The points most deserving of attention in this improved Microscope, recently constructed by Messrs. Powell and Lealand, are the following:—The double pillar, as first made by Mr. George Jackson, which possesses the advantage of being lighter, and distributes the weight more equally upon the foot. We have also introduced a circular motion to turn the body off the stage to examine the object, and to change the object-glass to prevent it from falling upon the object. The stage is made larger and stronger than in former microscopes of this size; and the pinion and screw are of the same diameter as in the larger instrument, above alluded to. This description of stage was first constructed by Mr. Turrell. There are, however, two or three other improvements and modifications, such as the method for adjusting the object glass to compensate for the thickness of the glass covering the object, &c.

The annexed Engraving shows *the Microscope in the position for general use*. As the most convenient method of using the instrument is in this position, it will be necessary, after taking it out of the case, to turn it by means of the pillars on its moveable foot, in order that the principal weight may be over one of the feet. When the person using it is standing, and the body of the Microscope perpendicular, it is then firmest as taken from the case.

A. *The coarse adjustment* for the body, which rests on two rollers and is moved by a rack and pinion.

B. *The fine adjustment*, which is a screw with a cone, against which there is a spring pressing against the cradle, which carries the compound body.



(Powell and Lealand's New Achromatic Microscope.)

C. *Milled Head*, which moves the stage to the right and left.

D. *Heads that move the stage at right angles to the other.* (C)—There is one head on each side of the stage to this motion, in order that both hands may be employed at the same time, one on C, and the other on the opposite side, when a rotatory movement is required to search for animalcules, or other objects. When the two screws, C and D, are used together, a diagonal motion, and when separate, motions at right angles with each other, are obtained.

E. *Arm for holding the stops*, which are used when viewing opaque objects.—To place them for use, push down the mirror G to the extremity of the stem, put the stop into the spring-hole, turn it into the centre of the stage, and raise it as high as the slide on which the object is placed will admit of.

G. *Mirror for illuminating objects.*—When the concave side is used, it should be raised nearly to the stem, in order that the rays of light proceeding from it may reach the object before crossing, for by this means the most intense light is obtained. It is invariably used for opaque objects, together with the Lieberkuhn. At night it will be necessary to use the larger condensing lens, which should be placed at about its focal distance from the lamp, with its convex side to the mirror, and adjusted till the rays of light fill it

H. *Spring-piece for holding the slides on the stage.*—The most convenient mode of placing them is, to push up the spring-piece sufficiently high to allow the slide to go on the stage, and then compress it until it holds it. Any number of slides of the same width may then, after it has been set, be put in without that trouble Should the slides be very wide, in order to have the whole range of the stage it will be necessary to observe if the centre of the slide corresponds with the line on the centre of the stage, if not, it must be altered until it does.

The following table exhibits the magnifying power of the object-glasses with each eye-piece

Inch	1/16	1/8	1/4	1/2	1	2
First and longest	700	330	170	75	40	20
Second	1400	660	340	150	80	40
Third and longest	2500	1200	600	250	140	70

For the complete details, see the *Microscopic Journal*, No 12, whence the preceding has been abridged

PORTABLE POCKET MICROSCOPE

Mr. Cary, of the Strand, has constructed this simple and portable instrument of sufficient power for the general purposes of the Physician, the Naturalist, and for illustration in the Class-Room. This little microscope is very slightly modified from that invented and used by Mr Children some years since it is so constructed as to view objects either transparent or opaque, the latter being accomplished by means of Lieberkuhn's to the half and quarter inch single lenses only Either of these powers is well adapted for viewing such objects as the Foraminifera, portions of fine anatomical injections, parts of insects, and the like

The instrument consists simply of a bed on which the object-holder is made to move to or from the power, by means of an endless screw, turned at one extremity by a milled head The thread of the screw is sufficiently fine to adjust and focus the objects viewed by a doublet, which is the highest power that can be conveniently used. At the opposite extremity to the milled head, there is fixed beneath, a handle, which, by means of a hinge, folds back to the under side of the bed, as does also the part for holding the powers, rising in the opposite direction to the handle Both of these portions may then, for portability, be placed in the same plane as the bed The portion intended to carry the springs for holding the slide is made so that the part ordinarily employed for carrying the object may be instantly removed and replaced, or any other contrivance fitted, such as a short pin of iron wire, having at the end a ball-and-socket joint, which will enable the observer to move the object in any convenient position

The powers accompanying this little instrument are half-inch, quarter of an inch, and tenth single lenses, with Lieberkuhn's or silver dishes to the first two, and a doublet. A condensing lens fits on to the bed, and is capable of being moved in the line of the object glass to any convenient distance.

The great advantage of this form of microscope over those generally constructed as single microscopes, is that of enabling the observer to view the object without stooping continually, and placing his body in the position which is so liable to produce fatigue. By holding the bed of the instrument as nearly parallel as possible to the flame of a lamp or candle, or holding it against a clear sky, a sufficient degree of light is obtained to work with advantage with the powers intended to accompany it.—*Microscopic Journal*, No. 16.

NEW CEMENT FOR MICROSCOPIC PURPOSES.

M. OSCHATZ recommends, as a Cement or lute for glasses containing microscopic objects, a composition of sealing wax and white lead;—and for the purpose of keeping apart glasses, so as to prevent injury by their pressure upon delicate objects,—rings made of a vegetable pith, such as is afforded by the *Helianthus annuus*, or the Chinese rice-paper.

APPARATUS FOR VIEWING THE CIRCULATION OF THE BLOOD.

THIS apparatus, (peculiarly adapted for public lectures,) is composed of a small box enclosing a frog, the tongue of which is easily placed for viewing the circulation of the blood in the arteries, veins, capillaries, and even in the interior of the follicles. A compound lens is adapted to this box, opposite to a hole which allows the direct light of the sky, or that of a wax candle, according to circumstances, to fall upon it. A low power is sufficient to see the circulation of the blood in the interior of the tongue drawn out of the mouth of the animal and spread like a membrane. One of these apparatuses presented to the Academy was constructed by M. George Oberhauser, the other by M. Soleil, optician, after the pattern of M. Donné.—*Comptes Rendus*, 1841, p. 799; *Microscopic Journal*, No. 11.

NEW OPTICAL FACT.

M. E. BECQUEREL has communicated to the Academy of Sciences, at Paris, the following curious fact,—viz. the power of destroying the force of a phosphorescent object under the influence of the rays of one colour by throwing upon it the rays of another colour. Thus, for instance, phosphorus, formed of calcined sulphate of barytes, becomes very brilliant under the influence of yellow rays, but it is extinguished as a red hot coal would be in water, by throwing upon it rays of green or yellow.

PORTABLE DIORAMA.

THE Diorama, the ingenious invention of the celebrated French artist, Daguerre, is a painting fitted up so as to receive light both in front and behind, by the full or partial admission, or total exclusion, of either of which lights a great variety of effects may be produced. No light is admitted to the eye except that which proceeds from the painting

The Diorama is usually executed on an extensive scale, but it occurred to Mr Tait, advocate, of Edinburgh, that it might be made upon a much smaller scale, and, accordingly, (before the publication of Daguerre's description,) Mr Tait constructed for the reception of sketches in water-colours a small box, having, for the admission of light before and behind, openings capable of being closed by moveable shades, and having a small opening in front, through which the sketches might be viewed Upon placing them in this apparatus, many of the dioramic effects were produced as passing gleams of sunshine, day melting into moonlight, day fading into darkness, followed by morning gradually disclosing the landscape, having its former verdure shrouded with snow

The apparatus may be thus detailed —

1 *The Box* —Stretching frames are to be prepared for the paper or linen, on which the pictures are to be executed, the frames being thick and narrow, and bevelled off These frames are inverted in succession through a slit in the top of the box, about two thirds distant from the front, and are received into a groove projecting from the top, sides, and bottom of the box, of such breadth as fully to cover the front of them

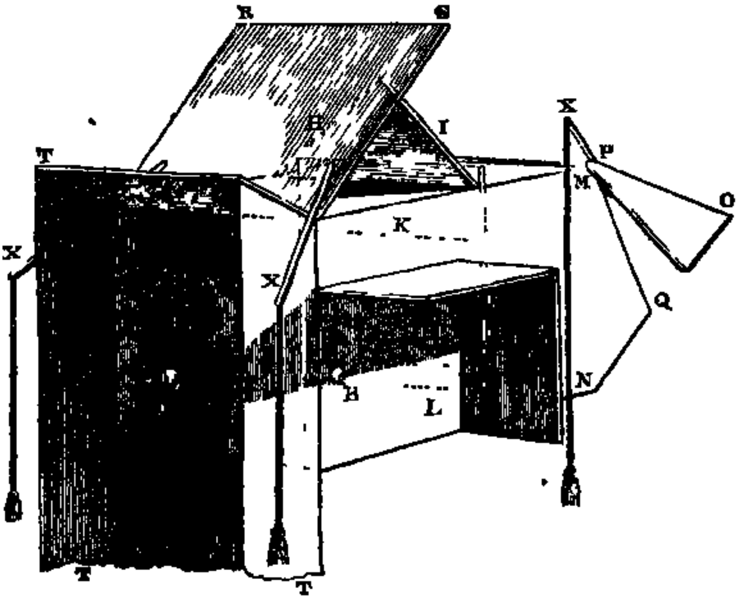
Two openings, one above in front, and another behind, admit the light, and both should be as large as possible The openings have a play of fine tissue paper, or Persian silk placed over them, to diffuse the light this is moveable, and is usually white, but may be of an orange, purple, or blue or other tint, and one or two flies may be used The shades for the openings may be made to open and shut, so as to exclude all light when closed

The eye hole in front ought to be opposite to the ordinary height of the horizon of pictures, perhaps about a third or fourth part of their whole height A small tube, of about two inches in length, is fixed before that opening The outer end is to be about 1¼ inch long, and an inch high, and to fit the eye, so as to screen it from extraneous light, whilst its upper end must expand into an oblong opening, so as to allow the spectator to view the entire picture The tube may be made to receive lenses to magnify the picture, if desired The internal end of this tube must be so constructed as to prevent light from above shining into it

The inside of the tube, and every part of the box seen through it, ought to be made as black as possible, for which purpose black velvet is very effective The rest of the inside, including the inner surface of the shades, ought to be white, in order to reflect light The front of the box should be black outside, and surrounded by a black curtain

There should also be a small opening and tube, through which an exhibitor may view the picture, when the spectator is unacquainted with the management of the apparatus. It should be on the same level as the spectator's tube. If the box be large, so as to admit of a distance of 8 or 9 inches from the spectator's tube, it may be in front; if not, on the side close by the front, and the pictures may be reflected to it by a very small mirror within the box. There should be placed over and behind it a black moveable shade, in two parts, the portion of the box within which should be painted black.

The annexed figure shows a perspective view of the box.



(Tait's Portable Diorama.)

A, Eye-hole for the spectator.
B, Ditto, for the exhibitor, with a shade over it.
C, Small mirror reflecting the picture to the exhibitor.
D, E, F, Form of front light.
H, I, Triangle to prevent a too sudden increase of light on raising the shade, R S.
K, L, Picture in its groove.
M N, Back light. The slope N Q is closed. The slope M Q is open. It and the front light D E E, are covered with tissue-paper, or other appropriate material. The back shade P O extends beyond the opening. The intention of this construction is to admit the light in a proper position, and very gradually.
Q T, Curtain hung in front, to shade completely the light from the spectator.
X X X, Levers for raising the shade easily, with cords attached.

2. *The Pictures* may be in water-colours upon paper, stretched upon the frames, or in oil upon linen. In either case, in painting the front, the lights are left only as in ordinary water-colour painting, so as to admit the light from behind to pass through; and body-colours are to avoided. The back of the picture is covered with a strong

semi-transparent tint in those parts through which the light is not to pass freely, or it may be rendered opaque, if required. When painting the back, no light is to be used except that transmitted through the front.

Objects painted behind are, of course, not seen by the front light; and objects painted in front appear so faint when seen by transmitted light, that it is easy so to paint the back as to make them disappear when the back light only is admitted, by which means great changes may be produced.

Further instructions may be found in Daguerre's description of his method of dioramic painting. The appearance of a *fog*, (not mentioned by Daguerre,) may be produced by using an ordinary single frame only, and painting the objects intended not to be affected by the fog on the front of the frame, (painting behind them also, if necessary to produce sufficient opacity,) and the rest of the scene on the back of it; then admitting light in front, and gradually either admitting light behind, (by which the parts of the scene painted on the back will appear to emerge from the fog,) or by excluding that light, by which they will appear to become involved in the fog.

A great variety of effects of day-light and moon-light may be produced by judicious management of the pictures, and by the adoption of contrivances sufficiently known or obvious to those who have paid any attention to art generally.

3. *The Light. In day-light*, the back of the box is placed close to a window, and only light enough admitted into the apartment fully to light the box. *At night*, the openings may be lit with oil or gas, or even with a few candles, if the box be small. The very strong orange tinge of ordinary artificial light is unfavourable to the natural and pleasing effect of the pictures, but it may be counteracted, as in night scenes or snow views, by interposing tissue-paper or other material tinted blue.

The effect produced depends in a great measure on the management of the light, which a few experiments will enable any one to regulate. Mr Tait has submitted his ingenious invention to the Royal Scottish Society of Arts; and it will be found described and illustrated in *Jameson's Journal*, Nos. 63 and 65.

Electrical Science.

ELECTROLYTIC ACTION

On November 15, a paper was read to the Chemical Society, by Mr Harrup, of the highest interest to the investigator of Electrolytic Action. Mr H. has constructed a battery, composed of six small jars, (about 4 ounces capacity,) which he partially fills with sulphuret of potassium; in these are severally immersed six smaller porous earthenware jars, (contents about 1 ounce,) filled with nitric acid; *cylinders of platina only* are plunged in both solutions, and the arrangement being completed, connexion was made with the usual apparatus for decomposing water and collection of the mixed gases, of which, by the apparatus now described, one cubic inch was obtained per minute. In the porous earthenware vessels, the nitric acid is deoxidised, deutoxide of nitrogen being given off; whilst in the outer jar the sulphuret of potassium is oxidised, being found to consist of sulphate, sulphite, and hyposulphite of potash. Electrolytic effects, not so powerful, but similar, were obtained by charging the outer vessel with a solution of sulphate of protoxide of iron, whilst the inner vessel was excited by a solution of sulphate of peroxide of iron; the action continuing until both solutions approximated to like states of oxidisement. The theoretical views deduced from these experiments were clearly explained by Mr H.; but as we should not be doing justice to the ingenious investigator if we narrated them in other than his own language, we must refer our readers to the *Transactions*, which will be shortly published, for further details.—*Annals of Chymistry*, No. 8.

TO OBTAIN ELECTRIC LIGHT

On April 19, were read to the Electrical Society, Notes from Dr Ellice, of Genoa, stating that he obtained the Electric Light by dropping on the plate of an electroscope any of the following substances, reduced to powder in a coffee mill:—Coffee, wheat, rice, peas, beans, millet, sulphur, gunpowder, cream of tartar, gum arabic, sugar, marble, chalk, lime, resin, sulphate of copper, rock, sand, salt, bricks, &c.

GALVANISM

M. Matteucci has stated to the Academy of Sciences, at Paris, that he has succeeded in reproducing the celebrated experiment of Galvani, by putting the nerves and the muscles of a living animal in communication with each other. This instantly produced an electric current, susceptible of being multiplied by an arrangement similar to the voltaic pile; and he has thus produced deviation in a galvanometer, amounting to 25 degrees.

ELECTRIC ORIGIN OF THE HEAT OF COMBUSTION

Mr J. P. Joule has stated to the British Association, that he accounts for the Heat evolved by the Combustion of certain bodies on the hypothesis of its arising from resistance to the conduction of electricity between oxygen and the combustibles, at the moment of their union. Taking this view of the phenomena, he shows that the heat evolved by the union of the atoms is in proportion to the electromotive force of the current passing between them—in other words, to the intensity of their chemical affinity. Mr. Joule instanced copper, and explained the manner in which he had obtained the theoretical results for it. He alluded, in passing, to the fact, that pure water is not at all decomposed by ten pairs of Smee's battery in series, the current being thereby almost, if not quite, cut off. A diagram gave the quantities converted into protoxides of potassium, zinc, iron, copper, and hydrogen, with Dulong's results and his own in parallel columns. Another column gave the theoretical results, and another the corrected theoretical results, which latter agreed very nearly with the experiments of Dulong and the author. An extensive series of experiments conducted by Mr. Joule seemed to indicate that heat is lost when light is evolved; but in so slight a degree, that his experiments on the heat of combustion needed not to be corrected for it.

To sum up the correctness of the idea first stated by Davy, and supported by Berzelius, that *the heat of combustion is an electrical phenomenon*, is now rendered sufficiently evident, as well as that the heat arises from resistance to the conduction of electricity between the atoms of combustibles and oxygen at the moment of their union. Of the nature of this resistance we are still ignorant.

PHENOMENA OF CHEMICAL INDUCTION.

M. **Arago** has detailed to the Academy of Sciences, at Paris, two memoirs, by Mr. Dove, "On the Phenomena of Chemical Induction" An electrical current causes, in a mass of iron placed near it, two kinds of phenomena—one corresponding to magnetism, the other to dynamical electricity. The author of these memoirs announced that he had succeeded in separating the two classes of action, by giving them different degrees of relative intensity, and that he had shown the magnetic action to exist in substances where its presence had not been suspected.

CIRCULAR POLARIZATION APPLIED TO CHEMICAL INQUIRIES.

Prof. Powell has detailed to the British Association, an account of a Simplified Apparatus, for applying Circular Polarization to Chemical Inquiries. The application of the phenomena of circular polarization in characterizing certain liquid solutions, was fully pointed out by Biot, who also contrived a very accurate apparatus for examining the effects in question. But that apparatus being expensive and difficult of adjustment, Prof. Powell has devised a simpler instrument, sufficiently accurate for general indications, and for the objects of the chemical student. He places the solution to be examined in a common test tube, which must, of course, be fixed in a vertical position, below the tube is the polarizing plate making with it an angle of 35½°, and above it is a double refracting crystal, (rhomboidal calcareous spar,) in its natural state The light is thrown on the polarizing plate by a plane mirror, passes along the tube, (at either end of which it is limited to a small aperture), it is then separated by the crystal, and finally viewed through a lens which magnifies the separation, and also reduces the irregular light to perfectly circular discs. Tubes of various lengths may be used as occasion requires.

ELECTROLYZING POWER OF A SIMPLE VOLTAIC CIRCLE

Mr Solly has read to the British Association, a paper by Prof. Schœnbein, stating the effects of various experiments to establish the fact, that Voltaic effects may be produced without the solution of a metal, the usual source of voltaic action, but by nitric and various other acids.

CONTACT THEORY OF THE VOLTAIC PILE.

On April 19, was read to the Electrical Society, a communication in favour of the Voltaic Pile by M Martens, of Brussels The conclusions are briefly these —The electrical condition of metals, or their electro-motive power, is altered by contact with certain liquids, their chemical reactions are thus changed, the condition of alteration only affects the parts *immersed*, and this, with the part *emerging*, constitutes a pair, the metal being electrically heterogeneous different liquids modify to different degrees, and hence the same metal, with its ends in different liquids, constitutes a heterogeneous combination, and hence a voltaic pair the current does not depend on chemical action, the inversion of poles, attending the change to certain electrotypes, is due to the same property metallic contact is the only direct cause of the galvanic current chemical action cannot be, because electric tension is manifested before the circuit is closed constant batteries owe their value to the same action of the liquid on the plates

CONNECTION BETWEEN ELECTRICITY AND EVAPORATION.

Mr Rowell, of Oxford, suspended two flat evaporating basins, of 8½ inches diameter, by silk threads, over an oven in daily use, and placed in each of them eight ounces of water, then connecting one of them, by means of a thin copper wire, with the ground After twenty-five hours, the quantity of water evaporated from the insulated cup amounted to 2 oz 279 grs, whilst from the non-insulated vessel 3 oz 144 grs, or 345 grs. more, were evaporated —*Philosophical Magazine*, No. 128

ELECTRICITY OF PLANTS AND VAPOUR

On February 15, was read to the Electrical Saciety, a paper "On the Electrical Relation between Plants and Vapour," by Mr Pine After adducing further experiments in illustration of the superiority of vegetable over metallic points in drawing off electricity, evidence is given of the operation of the same principle in nature, and it is shown that quiet fogs are *electrical* and *lasting*, because they do not move from place to place, and pass among the conducting points of living vegetation, and that moving fogs are *unelectrical* and *transient*, because, in their transit from place to place, the vegetable points draw off their electricity, and at the same time effect their condensation

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ELECTRICAL GROWTH OF PLANTS

Mr Pine, in a paper read to the Electrical Society, "On the tendency of Electricity to promote the Growth of Plants," dwells upon the positive state of the air, and the negative state of the soil He brings many cases in proof that the luxuriance of vegetation is in proportion to these states A drooping narcissus being removed into a room, the atmosphere of which was constantly surcharged with electricity from a machine often used for medical purposes, revived and attained the gigantic height of 36 inches Mustard-seed, in a pot whose soil was negatively electrized, vegetated with greater vigour than seed in a positive soil, and far greater than seed in its natural condition —*Philosophical Magazine*, No 128

NEW GALVANIC BATTERY

M J A Van Melsen, of Maestricht, has constructed this Battery, which is a great improvement upon the Wollaston it is made by placing the plates as close as one fifteenth of an inch by amalgamating the zinc, and by immersing the whole series in one undivided trough The great increase of power obtained by these means was given in the lengths of wire fused by different arrangements —*Bullet de l'Acad Bruxelles Proceedings of the Electrical Society*

POWERS OF A WATER BATTERY

Mr H M Noad, in a communication to the Electrical Society, states that two copper discs are connected with the terminals of a series of 500, and a pith ball insulated and suspended between the two, vibrates without cessation it had been in motion a fortnight, with the exception of a few intervals, when it was removed to give place to other experiments —*Philosophical Magazine*, No 128

FORM OF A VOLTAIC BATTERY

On November 15, was read to the Royal Society, a paper by Alexander R Arrott, Esq, "On a form of the Voltaic Battery, and the mode of action of Chemical Affinity in the Voltaic Circle" Now that the Voltaic Battery is employed in several manufactures, and its use likely to extend soon to others, the saving of the zinc or positive metal, which is dissolved, is an object of interest The construction also of batteries, in which an intense chemical force is obtained from other sources than metallic oxidation, suggests important theoretical inquiries M Becquerel obtained effects, as he supposed, from the combination of acid and alkali, which Mr Faraday does not reject, although not fully included in his theory of voltaic action Mr Arrott finds, that they are only easily deoxidated acids, such as nitric and chromic acids, which thus act with alkalies, and that it is really their oxygen, combining with the hydrogen of water, which produces the current, and not the combination of acid with alkali. The most efficient arrangement of this sort is ordinary nitric acid, a solution of sulphuret of potassium, separated by porous stoneware, with a plate of platinum in each liquid. A single pair will decompose water. The instrument exhibited, consisted of six pairs, each being a cylinder of one inch in diameter within, another of two inches, and both two inches in depth. The inner cylinder was porous, and contained nitric acid, of density 1·35; the outer cylinder contained solution of sulphuret of potassium, of density 1·14. Circular plates of platinum foil, which may be exceedingly thin, were placed in each liquid, and alternately connected. In short, the construction was precisely similar to Mr. Daniell's constant battery, except that both metals were platinum, and the fluids of course different. The battery described decomposed water to the extent of half a cubic inch of mixed gases per minute, for two or three hours. Deoxidation proceeds rapidly in the nitric acid, in which deutoxide of nitrogen appears; while a corresponding oxidation occurs in the sulphuret of potassium, or the oxygen of the former is carried, by a chain of voltaic decompositions, to the latter. Hence, the conditions of activity in such a battery are, attraction for oxygen in one liquid, (as in sulphuret of potassium,) and the power to supply oxygen readily by decomposition in the other liquid, (as in nitric acid) The more highly the two liquids possess these opposite properties, the more intense the action of the battery. The limit of this action was also shown to be the point at which the oxidating actions of the two liquids are equalized Thus, when the liquids in the two cells, and in contact, are per-sulphate and proto-sulphate of iron, on connecting together the platinum plate from each, oxygen continues to proceed from the first to the last, till the proportion of per- and proto-sulphate of iron comes to be the same in both vessels.

ECONOMICAL VOLTAIC COMBINATION.

Mr. F. W. De Moleyns has explained to the British Association the following "Economical Voltaic Combination of extraordinary power." The author stated that, while the discoveries in electro-magnetism gave promise of its ultimate application as a motive power far surpassing steam, it was matter of much importance to discover a mode of charging or giving attractive power to *soft iron* at a cost which should render it as a mechanical agent generally available. The voltaic arrangement now produced to the Society, the author believed, would be found to possess in a very great degree those advantages so much desired for the proper development of electro-magnetic energy. The combination consisted of acidulated solution of nitrate of ammonia, in contact with platina,—solution of muriate of ammonia and zinc; the nitrate solution being separated from the muriate by a diaphragm of wood, biscuit-ware, or other porous substance not acted upon by the liquids. The acidulated solution is thus prepared six ounces of nitrate of ammonia are dissolved in two fluid ounces of soft water, and this solution is then combined with an equal quantity, by measure, of the pure sulphuric acid of commerce, adding the acid gradually; the vessel containing the mixture being kept in a frigorific preparation, so as to prevent the heat evolved exceeding 100 degrees. The muriate of ammonia is dissolved in soft water to saturation. The zinc is *not* amalgamated, and the use of *cast* zinc is to be avoided The platina is the thinnest foil that can be procured; but the author found that box-wood, cut to the thickness of veneer, and charred on each side *superficially*, might be substituted, and used with equal advantage. The author stated that, with a voltaic combination consisting of half a fluid ounce of the acidulated nitrate solution, one ounce of the saturated solution of muriate of ammonia, a strip of platina 3 inches by 2, surrounded by a piece of sheet zinc of equal surface, he had succeeded in supporting a weight of 2,000lb., with an electro-magnet of the horse-shoe form, measuring 16 inches from pole to pole, and three-fourths of an inch in diameter, and that the attractive force, before contact, was in proportion.

BICHROMATE OF POTASH FOR VOLTAIC PAIRS.

On Jan. 18, the Secretary read to the Electric Society, a short account of the value of Bichromate of Potash in solution for exciting voltaic pairs. It had been employed, for the last six months, by Dr Leeson, with much success. It admits of being used without a diaphragm, it produces a battery very constant in its action, and throws down a very good and abundant deposit of metal, for which purpose, indeed, it has been employed to some extent, in one of the many practical applications of electrotype to the useful arts.

USE OF IRON WIRE FOR SECONDARY ELECTRO-MAGNETIC COILS.

Mr. J. E. Ashby, B.A., of University College, London, informs us that fine Iron Wire covered with cotton may be substituted for copper in Secondary Coils, with an increase rather than diminution of effect, at less than one-sixth of the price, and with a great saving of space. Half a pound of this wire costs 1s. 3d., and measures nearly 1400 feet.

With secondary coils so constructed, Mr. Ashby has been able, he states, to make the magnetic spark pass through nearly 1-100th of an inch between two wires, as in Mr. Crosse's experiments; and by means of a battery of about four square inches of negative plate, and a length of only 1100 feet in the secondary, to excite a current in the primary coil. Mr. Gassiot, Mr. Ashby observes, used for the same purpose 2100 feet of copper wire, and 20 large cells of Mr. Daniell's battery.—*Philosophical Magazine*, No. 139.

BLASTING BY GALVANISM.

Mr. Lyon, of Glasgow, the contractor for the new harbour at Dunbar, has successfully introduced the Galvanic Battery, to aid him in his extensive Blasting operations Several explosions of considerable magnitude have taken place. The largest contained 60lbs. of powder, distributed in five bores of great depth. The bores were placed so as mutually to assist each other, and the conducting wires so arranged, that the whole five were fired simultaneously by one battery. It was expected that by this method the effect would be much greater than exploding the shots singly; and the almost incredible quantity of rock thrown down showed the correctness of the anticipation. In another instance, in order to throw down a part of the celebrated Castle of Dunbar, three bores (15 feet in depth) were run obliquely into the rock below the foundation. They were exploded together, and lifted from its bed, in one unbroken and compact mass—a body of masonry weighing not less than 150 tons.

NEW BATTERY FOR BLASTING ROCKS.

On July 19, Mr. M. Roberts communicated to the Electrical Society, the construction of a very simple and effective Battery for Blasting by Voltaic Agency.

Some four years ago, Mr. Roberts communicated to the Royal Society of Edinburgh, the superior efficacy of combinations of zinc and *iron* over those of zinc and *copper*, twenty-six inch bars of which he finds most efficacious for a blasting battery. As the great value of this arrangement depends upon the peculiar manner of connecting the respective metals, we will do our best so to describe it as to enable our readers to construct for themselves. Twenty plates of iron and a like number of zinc are prepared, and are placed parallel and alternate to each other, as in the ordinary arrangement for the acid battery, and they are thus connected —let the zinc plates be numbered 1, 2, 3, &c., and the iron *a*, *b*, *c*, &c ; and let *a* be at one *end* of the series then first connect *a* and *b*, and afterwards connect 1 to *c*, 2 to *d*, and 3 to *e*, and so on. A rough sketch of such an arrangement will show that *all of both* sides of *each* plate is brought into active service, and that there are no counter currents. A box 8 inches long will contain a series of 20, and may be of wood rendered water-tight by white lead To facilitate the removal and immersion of the plates, a frame is made to contain them. The battery is excited with one of sulphuric acid to thirty of water —*Mechanics' Magazine*, No. 990 ; *abd.*

ELECTRO-MAGNETIC STEELYARD.

Prof. Jacobi has constructed this instrument to determine the lifting power of electro-magnets; and it differs from the ordinary steelyard in having the power applied *between* the fulcrum and the weight. The latter is fixed on wheels; the lever being counterpoised by a weight passing over a pulley —*Proceedings of the Electrical Society.*

ELECTRICAL CLOCKS.

In front of the Royal Polytechnic Institution is a Clock of large size, going by the action of voltaic electricity, the dial plate of which is illuminated at night. For the purpose of keeping correct time simultaneously in a multitude of such clocks, the inventor proposes to fix a "regulator" in a central position, which is there to receive from a galvanic battery a continuous stream of electricity, to be dispersed by itself through the agency of an electro-magnet, to any number of time-pieces with which it might be placed in electrical communication, all of which would consequently keep time with one another, and with the controlling regulator, and Mr. Bain, the inventor of this electrical clock, avers that it will never require attention as long as the "regulator" is kept in motion, and the galvanic battery is supplied with its necessary elements.—*Mechanics' Magaz.*

THE GALVANOMETER.

M. MELLONI has read to the Academy of Sciences, at Paris, a new method of varying at will the sensibility of his Galvanometer, and, when desirable, greatly increasing its power of measuring minute electrical charges, and, by their means, minute changes of temperature. The paper is too long for extraction in an intelligible form, but will be read by electricians with great interest. — *Mechanics' Magazine*, No. 970

HYDROSTATIC GALVANOMETER.

MR IREMONGER has described this instrument to the Electrical Society. A small bar-magnet is inserted in a cork float, and so arranged as to float perpendicularly in water contained in a glass tube. Around the latter is a moveable shelf, supporting a De la Rive's ring, through which the current to be examined is sent. The effect is to sink the floating apparatus in *direct* proportion to the power developed. The action of this instrument depends upon the law of the pressure of liquids, which is simply as their heights Several rough models have been constructed, and found to act well, and if the opinions in this paper should be borne out, the experimental philosopher will obtain an important and much-needed instrument.

NEW ELECTROMETER.

M J. C. OERSTED has constructed this instrument; in which Coulomb's rod is a brass wire, hanging from a silk fibre by a small iron stirrup *slightly* magnetised. The ends of the rod rest against a semicircle of brass, by means of which the electricity is communicated, and is stated as being extremely delicate.—*Proceedings of the Electrical Society.*

ELECTRIC GILDING

PRINCE LOUIS BONAPARTE has exhibited to the Scientific Congress at Florence, (in 1841,) some platina gilt by De la Rive's process, and observes that this metal takes the gilding better than silver He explains this, on the one hand, by the greater density of the platina; and on the other, by the insoluble layer of chloride of silver, which must withstand the perfect gilding of silver.

GALVANIC MANUFACTURE OF PLATED GOODS.

M. BELFIED LEFEVRE has communicated to the Academy of

Sciences, at Paris, a process by which the application of Galvanoplastics is adapted to the manufacture of plated goods of copper and silver The operation differs from gilding and silvering, for, in lieu of precipitating a thin layer of gold or of silver on a certain metal, vessels of any shape are formed of leaves of silver and copper, in which the two metals may exist in any proportion whatever To attain this end, M Lefevre first precipitates on a metallic surface (a plastic cast, which has been covered with black lead, will answer equally well,) placed in connection with the negative pole of a voltaic arrangement, a layer of perfectly pure silver, to which any desirable thickness may be given, and this layer of silver is succeeded by a deposit of copper When the copper has attained the requisite thickness, it is removed, and the plated article is detached from the mould, and it will then serve, without any preparation, for photographic and probably many other purposes —*Comptes Rendus Annals of Chymistry*, No 8

A NEW AND EASY METHOD OF COVERING COPPER AND BRASS WITH PLATINA

ONE part of solid chloride of platina is dissolved in 100 parts of water, and to this solution are added 8 parts of common salt, or still better 1 part of platino chloride of ammonia, and 8 parts of hydrochlorate of ammonia are placed in a flat porcelain vessel, 32 to 40 parts of water poured over it, the whole heated to boiling, and the vessels of copper or brass perfectly bright, are placed therein They will be covered in a few seconds with a brilliant and firmly adhering layer of platina —*Annals of Chymistry*, No 6

REDUCTION OF SOLUTIONS CONTAINING PLATINA, BY MEANS OF ZINC

THE process recommended by Parisot has been found practically useful It is as follows —The salt containing platina or its solution is mixed with some sulphuric acid, and a piece of zinc put into it The black precipitated metallic platina adhering to the zinc is removed by means of the same acid —*Annals of Chymistry*, No 6

TINNING AND ZINCING COPPER AND BRASS BY THE MOIST WAY

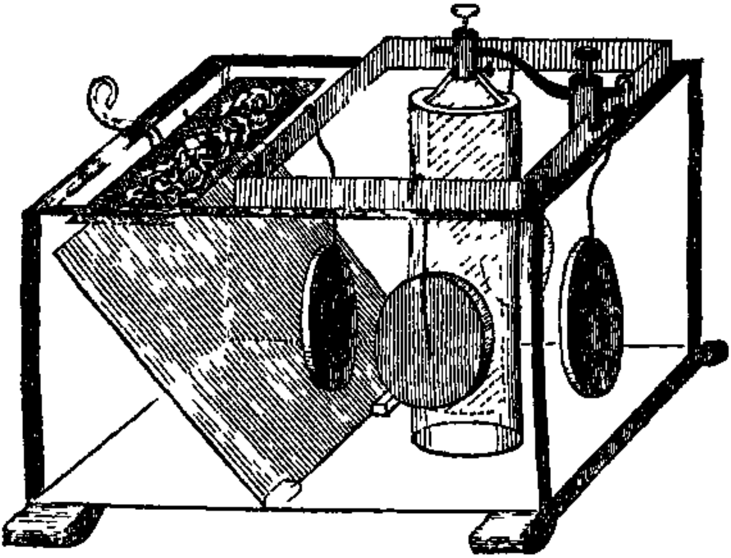
PLATES of copper or brass placed in a boiling solution of stannate of potassa mixed with turnings of tin, are, in the course of a few minutes, covered with a firmly attached bright layer of tin—a method very useful for tinning instruments, &c

A layer of zinc may also be obtained on the same metals by employing chloride of zinc pure zinc-turnings being present The same object can be attained by means of zinc and a solution of hydrochlorate of ammonia —*Boettger's Beitrage*

IMPROVED ELECTRO-METALLURGIC APPARATUS

MR W K BRIDGMAN has communicated to the *Mechanics' Magazine*, No. 987, the following simple, cheap, and efficient Apparatus of single cell, which requires no further attention when set in action, till the acid in the tube becomes saturated.

The crystals of sulphate of copper being placed on the wire frame, (which is covered with muslin, and dips just beneath the surface of the solution,) are gradually dissolved. The saturated solution being the heaviest, falls down on the glass plate placed obliquely under the frame, and is carried to the part where the medals are suspended; forcing the upper stratum, which is the lightest, from being partly deprived of its copper, to the crystals, which again become saturated; thus keeping up a continued circulation, and maintaining the whole of the solution at its point of saturation, let the decomposition go on ever so fast.



(Improved Electro-metallurgic Apparatus.)

The box is ¾ths of an inch thick, and cemented; its inside dimensions are 5½ inches in depth, 4½ inches in width, and 8 inches long; the porous tube is 6 inches high, the copper rim 1 inch wide and ⅛th thick, bent to a square of 4¾ inches, but not soldered. Medals from 4 inches diameter, down to seals the size of a sixpence, may be made with equal ease and certainty.

The zinc plate may be immersed to any depth, by turning the connecting wire on one side, and placing the binding screw on its edge, instead of the end.

ARTIFICIAL GEMS MADE BY VOLTAIC AGENCY.

On June 21, was read to the Electrical Society, a paper—"On the transfer of Mineral Substances through various Fluids by Voltaic Agency," by A. Crosse, Esq. Some years ago, the author observed results connected with a certain natural arrangement of mineral substances, which he thought might be imitated artificially, and it was thus effected pipe-clay was well kneaded into a basin, and in the pipe-clay were imbedded a piece of limestone and a shell Fine sand and pounded sulphate of iron were well incorporated and placed above the clay, in the sand was likewise imbedded a shell The whole being covered with water, was allowed to stand for many months, at the expiration of which time, it was found that the shells and limestone had lost weight, and round them had gathered groups of crystals of sulphate of lime in place of the carbonate lost The iron, which had been in connexion with the sulphuric acid, was about these nuclei in the form of per-oxide This experiment confirmed Mr Crosse's opinion, that though many mineral productions may be the result of electric agency, yet far the larger portion are produced by the natural electric affinity between the several elementary substances, developed in a manner somewhat analogous to that which may be readily traced in this experiment It was not until this arrangement was completed that Mr Crosse discovered one point of difference between this and nature's operations—the want of porosity in the basin, and this leads him to remark upon the increase of electrolytical action when the containing cells of a Daniell's battery are porous A series of experiments bearing upon the same point were minutely described in one, by an action analogous to that now described, a mould of a sovereign was made in a piece of marble, and another in which a glass rod connected with the *anode* was gilded, even above the liquid in which it rested Mr Crosse is of opinion, that the time is not far distant when we shall be able to produce artificially the precious gems

ELECTRO LACE

ON Feb 15, was read to the Electrical Society a description of Electro Lace, a novel and pretty application of the electrotype The electro lace is produced by depositing copper on the prepared surface of ordinary lace or net and the result is a fabric apparently of delicate metallic lace This may be plated or gilded, and is applicable for ornamental work The specimens in question were produced to supply the place of wire gauze by an experimentalist in Cornwall, (Mr Phillips), who was unable to obtain the material for the construction of a gauze battery

GILDING BY THE MOIST WAY

A VERY excellent method of Gilding by the moist way consists in communicating a negative electric state, by means of a feeble hydro-electric current, with the metal which is sought to be gilded, and which is immersed in a dilute solution of gold This solution ought not to contain more than 5 or at the most 10 milligrammes of gold for each cubic centimeter of liquid which should be as exempt from free acid as possible Pour the solution of gold into a glass cylinder, whose lower extremity is hermetically closed with moistened gut-skin, and introduce the cylinder into a vessel which contains some water, acidulated with a few drops of sulphuric acid The cylinder should be sup ported so as to prevent its lower surface from resting immediately on the bottom of the larger vessel. It is necessary to clean carefully, or even polish, the surface of the metal, whether silver or brass, that we desire to gild, lest a portion of it should be left ungilt. To attain this end, it is sometimes advisable to place the metal for a few moments in contact with zinc, in dilute sulphuric acid, so that hydrogen may be disengaged on its surface; after which it must be well washed. In order to gild an object, it must be fixed or suspended by a platina wire, to the other extremity of which is attached a plate of zinc; this done, plunge the article to be gilt in the solution of gold, and the zinc plate into the acidulated water. The power of the electric current may be moderated at will, by immersing more or less of the zinc plate, so that no hydrogen may be disengaged, and in this case the chloride of gold is alone decomposed. After a minute, the article to be gilt is withdrawn, wiped dry with a fine linen cloth, rubbed a little, and again immersed. After two or three immersions, the metal will be found to have been sufficiently gilt.—*M. de la Rive.*

A most elegant application of the preceding process has been used for engraving copper plates with aquafortis. The polished surface is gilt according to the preceding direction, after which the engraving is confined to merely removing the film of gold from the parts to be acted on. The plate is then immersed in aquafortis in the usual manner. The acid leaves the gold intact, acting only upon the lines; so that it is easy afterwards to correct a fault which may have escaped observation, without the tedious process of re-covering with wax, &c. Moreover, the plate may be preserved without corrosion for years.—*M. Hamman.—Annals of Chymistry*, No. 1.

PLATINISING BY THE MOIST WAY.

MANUFACTURING and operative chemists will find exceedingly valuable an adaptation of the same method in order to produce a covering of Platina for their copper, &c. vessels. The experiment succeeds best when we make use of a dilute solution of the double chloride of soda and platina. Three immersions suffice: between each immersion it is necessary to dry the surface with fine linen, rubbing rather briskly, after which it must be cleaned with levigated chalk before re-immersion. When copper has been gilded in the moist way, the gilt surface has not a beautiful tint; but if the copper be previously covered with a pellicle of platina, a very beautiful golden surface may be produced.—*M. Boettger.—Annals of Chymistry*, No. 1.

ELECTRO-MAGNETIC RAILWAY LOCOMOTIVE.

A TRIAL of this very ingenious machine, constructed by Mr. Davidson, has been made on the Edinburgh and Glasgow Railway. The construction of the carriage is the first attempt which has been made in this country to apply the powers of electro-magnetism to railway traffic. The carriage was impelled along the railway about a mile and a half, and travelled at the rate of upwards of four miles an hour, which speed might be increased by giving greater power to the batteries, and enlarging the diameter of the wheels.

The dimensions of the carriage are 16 feet long by 7 feet wide, and it is propelled by eight powerful electro-magnets. The carriage is supported by four wheels of 3 feet diameter. On each of the two axles there is a wooden cylinder, on which are fastened three bars of iron at equal distances from each other, and extending from end to end of the cylinder. On each side of the cylinder, and resting on the carriage, there are two powerful electro-magnets. When the first bar on the cylinder has passed the faces of two of these magnets, the current of galvanism is let on to the other two magnets. They immediately pull the second bar until it comes opposite them. The current is then cut off from these two magnets, and is let on to the other two. Again they pull the third bar until it comes opposite, and so on—the current of galvanism being always cut off from the one pair of magnets when it is let on to the other.

The manner in which the current is cut off and let on is simply thus:—At each end of the axles there is a small wooden cylinder, one-half of which is covered by a hoop of copper, the other is divided alternately with copper and wood, (three parts of wood and three of copper.) One end of the coil of wire which surrounds the four electro-magnets presses on one of these cylinders, on the part which is divided with copper and wood, the other end of the coil presses on the other cylinder in the same manner. One end of the wires or conductors which comes from the battery, presses constantly on the undivided part of the copper on each cylinder. When one of the iron bars on the wooden cylinder has passed the faces of two magnets, the current of galvanism is let on to the other two magnets, by one end of the coil which surrounds the magnets passing from the wood to the copper, and thereby forming a connexion with the battery. This wire continues to press on the copper until the iron bar has come opposite the faces of the two magnets, which were thus charged with galvanism. On its coming into that position, the current is cut off from these two magnets, by the wire or rod of copper passing from the copper to the wood, and thereby breaking the connexion with the battery. But when the wire or rod of copper leaves the copper on the one cylinder, it leaves the wood, and passes to the copper on the other cylinder at the other end of the axle, and in so doing connects the other two magnets with the battery, whilst they pull the next iron bar in the same manner. At the other end of the carriage, there are other four magnets, and a wooden cylinder, with iron bars arranged in the same manner.

The battery which is used for propelling the machine is composed of iron and zinc plates immersed in dilute sulphuric acid, the iron plates being fluted, so as to expose greater surface in the same space. The weight propelled was about six tons.—*Edinburgh Evening Journal.*

ELECTRO-MAGNETISM AS A MOVING POWER.

THE Consul-General of the Netherlands, in a communication dated the 18th April, quoted by the *Mining Journal*, thus announces the removal of the hitherto great obstacle to the practical application of Electro-magnetism as an effective propelling power :—" Mr. Elias, of Haarlem, has invented a new machine for the application of electro-magnetism as a substitute for steam ; chiefly to remedy the defects which, in 1839, rendered the otherwise ingenious invention of Mr. Jacobi, of St. Petersburgh, a failure, in as far as practical utility is concerned. Those defects originated, it seems, in the erroneous supposition that the power of the magnetic bars exclusively resides in their extremities—whence the form hitherto given to all electro-magnetic machines—viz., that of a horse-shoe—which, while it occasions an unavoidable interruption of the magnetic stream at each new inversion of the poles, at the same time leaves the power resident in the remaining part of the bars wholly unemployed. The new invention of Mr. Elias, on the contrary, has the very great advantage of rendering effective the full power of the magnetic stream uninterruptedly, and throughout the whole body of the apparatus. This consists of two concentric rings of soft iron, standing on the same plane, of which the external one is immoveable, while that on the inside revolves round its own axis. By means of a piece of copper wire, wound about each of these rings, he has given them six magnetic poles, placed at equal distances from one another; the whole being so contrived that the one ring exerts its inducing power on the other throughout the whole circumference, and always at the same distance, A small, but very perfect, model of this important invention has been exhibited here ; and the result of its operation is allowed, by those skilled in such matters, to be such as to ensure the most triumphant success."

Mr. J. P. Joule, in a paper on the above subject, lately read at the Manchester Royal Victoria Gallery, stated the following to be the greatest result he had been able to obtain, with a powerful apparatus :—Each pound of zinc produced a mechanical force which raised 331,400 lbs. to the height of one foot, when the revolving magnets moved eight feet per second. The duty of the best Cornish steam-engine is 1,500,000 lbs., or nearly five times the extreme duty he was able to obtain by the consumption of one pound of zinc. This was so very unfavourable a result, that he almost despaired of Electro-magnetism being applicable to mechanical purposes in the place of steam. He did not see how any arrangement of the apparatus could make the duty of a pound of zinc much superior to the duty of a pound of coal; and, even if it could be attained, the expense of zinc was so great, compared with the price of coal, as to prevent such apparatus being ever used for any but peculiar purposes. Professor Phillips also stated that he had tried every plan, American and German, locomotive and stationary, and never yet found one apparatus that could not be stopped with the finger. The most perfect plan he had seen was one where there were two horse-shoe magnets ; the two poles were always in contact, and the centre of motion was the line adjoining the two poles. Though it had a lifting power of 200, he found it difficult to get a sufficient length of stroke: he was obliged to get it by a lever of the third kind, which reduced the power so much, that he could not get the lever to work. He tried it with a weight of 3 lbs., and it worked very well when the wheels were lifted up, but it would not move itself; it would not start. The distinction was overlooked between pulling and supporting. A magnet would support an enormous weight in contact, but at a distance of a quarter of an inch, it would not, perhaps, pull 2 lbs. A magnet that would support 2 cwt. would, perhaps, pull only a quarter of a pound a quarter of an inch.—*Mechanics' Magazine*, No. 970.

ELECTRO TELEGRAPHS.

On June 3, MM. Wright and Bain made the following experiments on the Serpentine River, in Hyde Park; which prove the important fact that the wires of the Electro Telegraphs do not, as has been imagined, require to be insulated from damp; and that the expense of enclosing them in pipes, (from £250 to £300 per mile,) need, therefore, be no longer an obstacle to their general introduction.

1. An electric current was first transmitted from a small Grove's battery across the river from bank to bank, through two copper wires immersed in the water, and left quite bare and unprotected. The successs of the operation was perfect.

2. A *single* wire was then laid along one bank of the river from the bridge, to near the south-east end, a distance of about half a mile, with both ends dipping in the water. The rest of the galvanic circuit was found to be completed by the water; that is to say, the water, indifferent conductor as it has hitherto been considered to be, of itself served the purpose of the second wire—the immense bulk and extent of the body of water notwithstanding. The current was transmitted through the partly liquid and partly metallic circuit thus formed, with the same instantaneousness as if it had consisted entirely of metal; reversed too, at pleasure; and this, times without number. Passing an electric current through such small jars of water as one is accustomed to see used in galvanic batteries is a comprehensive enough performance; but to transmit, in an instant, the product of a tiny pocket apparatus through a jar half a mile long, a quarter of a mile broad, and containing many million millions of gallons, is, it must be confessed, a thing passing all comprehension. We can but record the fact, and wonder.

3. A wire—single wire as in the last case, was finally laid with one end in the river, and the other in a well about 300 yards from it. The electric current was passed through this circuit, with the same facility and success as in the other experiments. Here was a triune circuit formed, consisting of the wire, water, and earth.

What the limits are to this conducting power of water, or whether there are any limits at all, remains yet to be ascertained.—*Mechanics' Magazine*, No. 988; *abd*.

THE CROSSE-MITE.

SOME interesting experiments have been contributed during the past year, in illustration of this much-debated organism. Thus:—On Jan. 3, Mr. G. Newport read to the Entomological Society,—a series of extracts from letters received from a friend near Sandwich, who had succeeded, after an experiment of eleven months' duration, in obtaining living specimens of *Acarus Crossii* from a mineral solution acted upon by voltaic currents, in the same manner as Mr. Crosse had obtained his specimens. The details of the experiments were given. Mr. J. E. Gray, who was present as a visitor, stated, that Mr. Children had made experiments precisely similar to those of Mr. Crosse; and which he had continued for several months, without having been able to obtain a single specimen.

On March 15, were read to the Electrical Society, the "Details of an experiment, in which certain insects, known as the *Acarus Crossii*, appeared, incident to the long-continued operation of a voltaic current upon Silicate of Potash, within a close atmosphere over mercury;" by Mr. W. H. Weekes. After alluding to the orignal experiment of Mr. Crosse,* and to the objections made that the insects might have sprung from ova in the atmosphere, Mr. Weekes states that he had resolved to provide against such contingencies. This he effected by placing the solution, which was prepared with the utmost caution, beneath a bell-glass, and was not disturbed from December 3, 1840. Late in October, 1841, the first insect was detected; on November 27, several were seen; subsequently, they were constantly to be seen, sometimes solitary, at other times in pairs, and occasionally three or four together. The operation was conducted in the dark, light being only admitted at those times when the progress was under examination. The voltaic current was from a short series of Daniell's battery. These creatures appear to love darkness; for, on the admission of a ray of light, they hasten away, and seek hiding-places in the recesses of the apparatus. Simultaneously with this, another arrangement was made, in which the current from a water battery was made to pass through a solution contained in a bell-glass of oxygen. Insects appeared in this on February 20, 1842, and eight or ten fine vigorous *Acari* were visible. This is but a brief summary from a very long and carefully written communication. The author assumes nothing; he does not venture to theorize, but gives a plain and explicit account of his experiments, and of their results. In expectation of a further development of insect life, he then left the operation to proceed; having, more completely to preclude objections, prepared another apparatus, in which nothing but glass, metal, and mercury, (distilled from its sulphuret,) entered.

On May 17, a note was read to the Electrical Society, from Mr. Weekes, stating, that when he commenced those experiments, during which insects had been developed, he made similar arrangements, and placed them in various parts of his house, without allowing the voltaic

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* The Cross-mite will be found figured and described in the Year-Book of Facts, 1839, p. 200.

current to pass through them; and in no case, by the strictest examination, could he detect any appearance of the insect.

On September 20, Mr Weekes further stated that he found, from continued observation, that these insects, whatever be their origin, are multiplied by the ordinary means of generation he has observed the development and departure of successive families, and perceives that the defunct are devoured by their survivors. On July 20, 1842, he terminated the experiment with the sulphate battery, and was so unfortunate as not to secure a single specimen of the insect. With respect to the spongy aggregations around the positive electrode, he has found they are not, as he anticipated, pure silicon, but apparently an inferior oxide of that element He quotes Dr Brown's opinion, that "it may throw light on the doubtful question of the atomic weight of silicon."

ECONOMY OF THE GYMNOTUS.

On March 15, were read to the Electrical Society, extracts from a letter from John Sams, Esq, of Surinam, containing "Information respecting the *Gymnotus Electricus*" Among the specimens possessed by Mr Sams were two in one tub, whose relative lengths were 30 and 15½ in. The smaller one was missed, and it was found that the other had swallowed it He soon, however, cast it up, and in the space of a few hours, died On post-mortem examination, it was found that the stomach was considerably ruptured Mr. Sams mentions that the report of a certain drug being an antidote to the shock of the Gymnotus is without foundation

On August 16, a paper by Mr H Letheby, A L S, was read to the Society, describing the *Gymnotus Electricus*, and containing reasons for believing that the electric energy originates in the brain and spinal cord. In reference to the anatomy of the fish, the author shows that the electrical organs are not super-additions of a peculiar structure, but are the result of an increased development of the aponeurotic termuscular septa, which become so arranged as to form long tubes, running diagonally from within and outward, so that the juxta-position of these tubes produces laminæ which run longitudinally to the animal The number of tubes in the entire organs is estimated at half a million. The organ is supplied largely by the spinal nerves, the peculiar nerve of Hunter, called by Mr Letheby the posterior or dorsal branch of the fifth, is distributed entirely to the muscles The author then alludes to the well-known researches of Williamson, Humboldt, Faraday, Walsh, Todd, Davy, Matteucci, and others, which have proved the analogy between the effects produced by electrical fishes, and those developed by our artificial combinations He then goes on to trace the connexion between these two divisions of the subject, and directs attention to two important facts —1st, that the organs are made up of aponeurotic septa containing an albuminous gelatinous fluid. and 2ndly, that these are furnished with a supply of nerves far exceeding the wants of the parts for the purposes of life Bearing in mind this latter fact, and then alluding to the voluntary nature of the shock, to its annihilation when the nerves are severed, and to its increase when the nerves are irritated, he concludes that the electric force originates in the brain and spinal cord, and is concentrated or made tense in the organ itself. He then gives a series of deductions to show that electricity and vital energy are, in a manner, identical. This paper was illustrated by an elaborate series of drawings, and also by anatomical preparations of the organ and the supplying nerves.

Mr. W. Hawkins, we find, has a third time endeavoured to obtain for the Electrical Society a live specimen of the Gymnotus, but has failed, the animal not surviving the voyage.

DEATH OF THE GYMNOTUS, AT THE ADELAIDE GALLERY.

THIS Eel died from mortification on March 14. It had lived there three years and eight months, having been received at the Gallery in August, 1838, in a very debilitated state. The reader will find notices of its habits, and the experiments made from time to time with it, in the *Year-Book of Facts*, 1839, p. 181, 1840, p. 131, (with a vignette portrait).* The most interesting and beautiful experiment performed by its electricity was in setting fire to a piece of silver-paper in a glass cylinder. One end of a conductor was attached to the paper, and the other to the eel, and by this means the paper was burnt.

Altogether, this Electric Eel may be considered to have lived longer than might have been expected in confinement.

THE TORPEDO.—GLOW WORM.

M. ZANTEDESCHI has confirmed the experiments of M. Matteucci on the Torpedo; he thinks that the nerves come from the dilatation of the *medulla oblongata*, which forms the fourth lobe with the gray matter covering it.

Mr. Morren has found phosphorus in Glow-worms, as well as a system of prisms or transparent lenses above the luminous matter.—*Proceedings of the Scientific Congress at Florence.*

ELECTRICITY OF STEAM.

MR. W. G. ARMSTRONG has resumed his experiments on this curious subject, and has, at length, ascertained, that the *place* where the excitation of electricity is effected, is that at which the steam is subjected to *friction*. Into an insulated boiler he inserted one end of a glass tube placed in a horizontal position, to the other extremity of which was affixed a stop cock having a passage through it considerably smaller than that through the tube, and in order to prevent any communication of electricity between the boiler and the cock by the deposition of moisture on the inner surface of the glass, Mr. Armstrong surrounded part of the tube with a red-hot iron cylinder

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* Engraved, also, (accompanied with ample details of the habits of this specimen,) in the Literary World, vol. iii. p. 34.

He then attached to the cock a second glass tube, from the extremity of which the steam was discharged Upon opening the cock, the ejected steam proved, as usual, to be positively electrified , but the boiler, which, in all former experiments, had yielded the opposite electricity to that of the steam-cloud, *now remained neuter* , and the *cock*, instead of the boiler, became negatively electrified It was obvious, therefore, that the excitation took place at the cock , where, by reason of the narrowness of the channel, the force of the current was chiefly exerted

Mr Armstrong then varied the form and material of the aperture at which the electricity was excited , and, contrary to what he had expected, he found that apertures which were calculated to produce an increase of friction, did not in general cause an increased electricity, and very often had an opposite effect Still, the intensity of the development proved to be greatly dependent upon the nature of the orifice employed , and to such a degree has Mr Armstrong increased the electricity by modifying the orifice, that he has produced sparks four inches long, with an expenditure of steam not greater than would be occasioned by a circular aperture 1-10th of an inch in diameter For further experiments and details, see the *Philosophical Magazine*, No 128 *

ON LIGHTNING CONDUCTORS

On May 17, Mr C V Walker read to the Electrical Society, a paper on this important inquiry Having examined the steeple of Brixton Church, which was struck by lightning on Sunday, April 24th, the author of the paper saw in the damage done so good an illustration of the opinions delivered by Dr Faraday a few days previously at the Royal Institution, that he was induced to survey more carefully the path, and report it to the Society , when the general conclusions arrived at were as follow —The steeple was surmounted by a copper cross, which formed the *first* good conductor , the *second* was 20 feet from this, and in passing along the interval the masonry about the cross was shivered to pieces, and the cross itself was forced out of its place , the *third* conducting series was *twelve* feet from the second here a second explosion occurred, and the base of a column, 3 feet in diameter, was shattered, and the shaft rent How strange it is that such occurrences as these are not guarded against ! If the "lateral discharge" be not well understood, the "disruptive" is The "lateral discharge" occurred in the belfry , and Mr Walker showed how it was connected with that property of electricity which induces it to take the *widest* as well as the *shortest* road He explained that when the fluid is passing along a most *ample* conductor, some of it will enter vicinal conductors, developing light and heat He then illustrated the method of conveying *safely* and *tranquilly* into these vicinal conductors, by forming metallic communications between them and the lightning rod, otherwise a lightning rod may become a most dangerous enemy, instead of a trustworthy protector

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* Several very interesting facts, illustrative of the "Electricity of Steam," by various experimenters, may be found in the Year Book of Facts, 1841, pp 132 3 4 , Year Book, 1842, pp 133 4 5

On July 19, Mr Walker resumed the above subject before the Electrical Society, to which he acts most efficiently as Honorary Secretary Having referred to his observations on the lightning flash at Brixton Church, he added that subsequent experiments tended rather to confirm than to change his opinion upon "lateral discharge" He then directed the attention of the Society to the following deductions —

1st —That the discharge of a Leyden jar does not resemble a flash of lightning, and, therefore that Leyden jars should not be employed in investigating the action of lightning rods

2nd —That the discharge from a prime conductor does, in all essential points, resemble a flash of lightning, and is therefore admissible in such experiments

3rd —That a wire, on which sparks are thrown from a prime conductor, represents a lightning rod

4th —That sparks will pass off from such wire, and, therefore, from a lightning rod, to vicinal conducting bodies, and,

5th —That these sparks may be prevented by connecting the vicinal bodies with the rod itself

The experiments were made by aid of the magnificent machine of the Polytechnic Institution, and are supported by a course of reasoning based upon the dissimilarity between the Leyden light and the lightning flash and the resemblance between the latter and that from the prime conductor It was shown that the length of the spark from the conductor is due to the action of *one* force in *one* direction, and that the shortness of the Leyden discharges is due to *two* forces, acting in *opposite* directions The importance of excluding the Leyden experiments from the field of inquiry is very evident from the fact that on them hinges a large portion of the conflict of opinions Using the new prime conductor, and throwing sparks from it upon wires subjected to every variety of arrangement, "lateral sparks" were always obtained, unless vicinal bodies were in close metallic connexion with the wire conveying the charge This fact was illustrated by a most important modification of the well known experiment with the metallic discs, and if this modification, which consisted in erecting an elevator rod beneath the great globe, forming the prime conductor, be legitimate, the danger of lateral flashes is evident It should be added that Mr Snow Harris, F R S in a paper read to the Electrical Society, on Sept 2, does not agree with the previous opinions of Mr Walker, but we have not space to quote his objections

During the past year, many serious accidents have been occasioned by lightning, and an intelligent member of the Electrical Society has suggested the propriety of their publishing some general directions as to the best methods of protecting churches and other elevated buildings

MR SNOW HARRIS'S LIGHTNING CONDUCTORS.

On October 13, *The Orestes*, 18, was prepared at the Royal Dockyard, at Portsmouth, for the purpose of practically testing the efficacy of her Lightning Conductors, by a series of experiments by Mr. Snow Harris, F R S , upon whose plan the Conductors have been fitted up She was moored about 100 yards from the jetty, between which and the ship, about midway, was placed a barge, containing a carronade. A wire leading from the positive end of a powerful electrical battery, in *The Semaphore* immediately opposite, was attached to a cup of gunpowder on her main truck. Another wire, leading from the negative sides of the battery, was attached to the gun in the boat A short wire was placed on the touch-hole of the gun, and led over the gunwale of the boat to the surface only of the water on the side nearest *The Orestes* There was no communication between the ship and the barge.

The object of the following experiments was to show that immediately an electrical discharge reached the mast-head, it passed down to and dispersed in the water, by means of the continuous line of conductors This was proved as follows the electric battery in *The Semaphore* was discharged, and the discharge passed along the copper wire from the metallic plate on the interior of the jar to the mast-head, where its presence was rendered apparent by the ignition of the gunpowder in the cup , it passed thence down the conductor on the mast into the hull of the ship, and along the conductors on the hull into the sea That it had arrived in the sea was proved by the ignition of the powder over the touch hole of the gun in the boat, and the consequent discharge of the gun , because the only means by which this gunpowder could be ignited was the passage of the electricity up the short copper wire which connected the touch hole of the gun with the sea , so that not only must the electric fluid have arrived in the sea, but it must have passed through it to this short copper wire in the boat It is almost needless to add, that so rapid is the discharge of the electric fluid, that the report of the discharge of the battery, the ignition of the powder at the mast-head, of that over the touch-hole of the gun, and the report of the gun itself, appeared simultaneous, notwithstanding the great distance traversed by the electricity , thus showing clearly that the instant the experiment arrived at the main truck, did the conductors clear it of the ship, and transmit it to the water

Several experiments were then made to prove that the principle held good in the case of the top-masts and top gallant-masts being struck , when the electrical current followed the continuous line, without at all diverging to those portions of the conductors which, by the striking of the masts, were placed in a position out of that line

Wire-rope conductors were then considered, and the several objections to them fairly and conclusively stated The danger of a man being killed in the bight of such a rope, while striking the top or top-gallant mast during a thunder-squall, was clearly proved by a very neat experiment Such a case was represented by gold-leaf or paper, and when an electric shock was passed over the paper, the gold was burnt up in the direction of the man, but remained untouched round the bight of the rope

Lastly, an experiment was performed to prove at once the complete protection afforded by the continuous conductor, and the apparent impossibility of the least action taking place on metallic bodies out of it, thus practically refuting the supposition of any lateral discharge taking place A model of a mast, about ten feet in length, was made in parts, and an interrupted line of metal placed in the heart of it Percussion-powder (which, it is well known, will inflame with the least spark of electricity,) was placed between these interruptions On the outer surface of the mast was placed a continuous conductor, the extremities of which were connected at each end of the model of the mast with the extremities of the interior and interrupted line of metal In order to make the experiments more complete, bands of metallic leaf were made here and there to surround the mast as hoops together with other metallic bodies which could enter into the mast itself, and touch the internal line of metal An intense shock of electricity was allowed to fall upon the upper extremity of the mast, where both lines of metal were in conjunction, with the view of discovering, (since the electric matter had thus, it may be said, the choice of two lines,) whether it would pass upon the metal within, or whether it would be dispersed between the two lines and pass down each, or whether it would only pass down the exterior line, and whether in passing down that line, it would cause a lateral discharge to enter the mast, or in any way to affect the interior This was a most severe test, from the highly inflammable nature of the percussion powder, but it succeeded perfectly As long as the continuous external conductor remained perfect, the discharges of electricity were innoxious, when, however, the exterior conductor was removed, and a similar charge was thrown over the models, the mast was blown to pieces by the ignition of the percussion powder, evidently proving that if the previous discharges had in any way or under any form pervaded the interior, this effect would have resulted in the very first instance

In repeating the experiment of passing the electric fluid through *The Orestes*, an accidental circumstance fully proved Mr Harris's theory, that *metals of themselves are not attractive*, and that *lightning will take the most direct continuous way to arrive at its course* The wire which led from *The Semaphore* to the cup containing the gunpowder at the mast-head of the ship was not properly placed, the light touching the mast a few inches below the cup The discharge, therefore, instead of continuing along the wire to the cup, was conveyed to the conductor at the spot where the light touched the mast and carried through the ship, and thence by the seat to the boat, where it fired the gun, leaving the gunpowder at the mast head unexploded

After Mr Harris had concluded his experiments, Admiral Sir

Edward Codrington said, that, from what he had witnessed, he thought it but right publicly to observe, that he felt perfectly convinced of the efficacy of the conductors upon Mr Harris's plan, which, after the conclusive and satisfactory tests they had that day undergone, would, no doubt, be generally used throughout the Navy.—*Abridged from the Times, Oct* 15

SINGULAR ACCIDENT BY LIGHTNING

On Oct 18, Mr Phillips reported to the Electrical Society, the particulars of an Accident by Lightning near St Austell, when two out of five children, who had taken refuge in a toll house, were killed The point of interest, in connexion with this accident, is, that the flash struck the very low building in which the little party had taken refuge, in preference to higher buildings in the immediate vicinity

NOISE OF THUNDER

M Tesan argues that when a cloud is electrized, the outward pressure of the electricity relieves it from the inward pressure of the air, in a degree proportionate to its electrical state, and hence it expands till the two antagonist powers are in equilibrio But, if any of the electricity escapes, as in a flash of lightning, the cloud instantly contracts, the vapour conglomerates into drops, the air rushes with a thundering noise, and the well known deluge of rain falls In these fundamental principles the author traces several analogous phenomena —*Comptes Rendus Proceedings of the Electrical Society*

ELECTROTINT

Mr Palmer has put forth another modification of the recent discoveries, in what he terms "Electrotint or the Art of making Paintings in such a manner that Copper Plates and Blocks can be taken from them by means of Voltaic Electricity" In this process, a metallic plate is covered with a white surface, on which the artist draws with a composition resembling black paint, and on this the electrotype deposit acts, so as to supersede the burin and mezzotint-roller The result is described in the *Athenæum* as, "in effect, a sort of compromise between mezzotinto and etching" The most successful specimen that we have seen is a fine Anglo Norman doorway, *electrotinted* with characteristic accuracy The entire process will be found lucidly explained in a pamphlet written by Mr Thomas Sampson, "for the use of artists and amateurs

NEW ELECTROTYPE PROCESS FOR COPYING ENGRAVINGS

A correspondent of the *Mechanics' Magazine*, No 985, believes the following to be quite new —Transfer, by pressure, a newly-printed impression of a steel engraving, wood cut, or lithograph, to a polished copperplate, previously cleaned by immersion in very dilute nitric acid, then connect it by means of a wire with the *positive* plate of a constant voltaic battery, while to similar wire, proceeding from the *negative* element, a piece of pure gold is affixed Both the "poles" are to be immersed in a trough, or earthen vessel, containing a solution of oxide of gold in cyanide of potassium After about half a minute, the copper-plate should be removed, when it will be found finely gilded, a film of gold being deposited thereon by galvanic agency Having proceeded thus far, the ink should be washed off the plate with oil of turpentine, when the unaltered copper below will be exposed to view A border of wax must then be put round the plate, and pure dilute nitric acid poured thereon, and allowed to corrode the copper to the required depth as that liquid has no chemical action whatever on the film of deposited gold, an etching is produced exactly resembling the plate from which the original impression was taken

GALVANOPLASTICS

On Nov 15, was read to the Electrical Society a notice "Of a new and important application of Galvanism," by Prof Jacobi, in which it is stated, that he succeeds in extracting gold from its ores by the Galvanoplastic art, and that he presented the King of Prussia with a plate of pure gold thus obtained, weighing $\frac{7}{11}$ lb troy He extracts silver in a state of aggregation

NATIVE MALLEABLE COPPER

Mr J A Phillips, of St Austell, in a communication to the Electrical Society, states that Native Malleable Copper as well as arborescent and moss copper, is produced by an action in principle the same as that artificially employed in the electrotype process

ELECTRICAL LIGHT

An officer of the Algerian army, during a violent storm, Sept 25, 1840 observed that the arms of the men, when piled in stands, exhibited no symptoms of the electric fluid playing about them, but when the men carried them, the points of the bayonets were strongly luminous, not, however, giving out any sparks The drops of rain that fell during the storm on the beards and mustachios of the men remained hanging from them in a state of phosphorescence When the hair was wiped, the phenomenon ceased, but was renewed the moment any fresh drops fell on it —*Literary Gazette*, No 1269

Chemical Science.

ATOMIC WEIGHTS OF ELEMENTS

MM MARCHOND and ERDMANN are at present engaged in a series of researches which seem to prove that Prout's idea of all Atomic Weights being multiples of hydrogen is correct. They have as yet examined only the following bodies -

Oxygen	=	100	Calcium	=	250	20
Hydrogen	=	12 5	Chlorine	=	450	36
Carbon		75	Silver	=	1250	100
Nitrogen	-	175	Lead	=	1300	104

Philosophical Magazine, *No* 139

LAURENT has made some experiments on the Atomic Weight of Chlorine The assumption of Berzelius's number perfectly agrees with the analyses made by M C , while considerable differences are visible if the atom be considered as a multiple of that of hydrogen Marignac determines the Atomic Weight by passing hydrochloric acid gas over heated oxide of copper He finds it 225 013, or thirty-six times that of hydrogen From this he calculates the Atomic Weight of Silver as 1374 0, and of Potassium, 198 5 Jacquelain finds the atomic weight of zinc to be 414 —*Comptes Rendus*, and *Phil Mag*.

ANIMAL CHEMISTRY

DR PLAYFAIR has read to the British Association, an Abstract of Prof Liebig's Report on Organic Chemistry, applied to Physiology and Pathology , which must be regarded as one of the most important contributions of the year *

The Professor's first Report had been read at the meeting of the Association at Glasgow, in the year 1840 The second he was about to bring before their notice In a third, the Professor intended to apply the principles of organic chemistry to diet and dietetics and under this head would be comprised the nutriveness of particular vegetables in the fattening of cattle

The first part of Prof Liebig's Report consisted of the examination of the processes employed in the nutrition and reproduction of the various parts of the animal economy In vegetables, as well as animals, we recognise the existence of a force in a state of rest It is the primary cause of growth or increase in mass of the body in which it resides By the action of external influences, such as by pressure of air and moisture, its condition of static equilibrium is disturbed , and entering into a state of motion or activity, it occupies itself in the production of forms This force has received the appellation of *vital force*, or *vitality*

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* A striking Paper on Dr Gregory's Translation of Prof Liebig's work, published in London last spring, will be found in the *Quarterly Review*, No cxxxix , pp 98 138

Vitality, though residing equally in the animal and vegetable kingdoms, produces its effects by widely different instruments Plants subsist entirely upon manures belonging to inorganic nature Atmospheric air, the source whence they derive their nutriment, is considered to be a mineral by the most distinguished mineralogists All substances, before they can form food for plants, must be resolved into inorganic matter But animals, on the other hand, require highly-organized atoms for nutriment They can only subsist upon parts of an organism They possess within them a vegetative life, as plants do, by means of which they increase in size without consciousness on their part, but they are distinguished from vegetables by their faculties of locomotion and sensation—faculties arising through a nervous apparatus The true vegetative life of animals is in no way dependent upon this apparatus, for it proceeds when the means of voluntary motion and sensation are destroyed, and the most energetic volition is incapable of exerting any influence on the contractions of the heart, on the motions of the intestines, or on the processes of secretion All parts of the animal body are produced from the fluid circulating within its organism, by virtue of vitality, which resides in every organ A destruction of the animal body is constantly proceeding Every motion, every manifestation of force, is the result of the transformation of the structure, or of its substance Every conception, every mental affection, is followed by changes in the chemical nature of the secreted fluids Every thought, every sensation, is accompanied by a change in the composition of the substance of the brain It is to supply the waste thus produced that food is necessary Food is either applied in the increase of the mass of a structure, (that is, in nutrition) or it is applied in the replacement of a structure wasted, (that is, in reproduction) The primary condition for the existence of life is the reception and assimilation of food But there is another condition equally important—the continual absorption of oxygen from the atmosphere All vital activity results from the mutual action of the oxygen of the atmosphere and the elements of the food All changes in matter proceeding in the body are essentially chemical, although they are not unfrequently increased or diminished in intensity by the vital force The influence of poisons and remedial agents on the animal economy proves that the chemical combinations and decompositions proceeding therein and which manifest themselves in the phenomena of vitality, may be influenced by bodies having a well-defined chemical action

Vitality is the ruling agent by which the chemical powers are made to subserve its purposes, but the acting forces are chemical It is from this view, and no other, that we ought to view vitality According to Lavoisier, an adult man takes into his system, every year, 837 lb of oxygen, and yet he does not increase in weight What, then, becomes of the enormous quantity of oxygen introduced in the course of the year into the human system ? The carbon and hydrogen of certain parts of the body have entered into combination with the oxygen introduced through the lungs and through the skin, and have been given out in the form of carbonic acid, and the vapour of water. At every moment, with every expiration, parts of the body are thus removed, and are emitted into the atmosphere. No part of the oxygen inspired is again expired as such. Now it is found that an adult inspires 32¼ oz. of oxygen daily. This will convert the carbon of 24 lb. of blood into carbonic acid. He must, therefore, take as much nutriment as will supply this daily loss; and, in fact, it is found that he does so; for the average amount of carbon in the daily food of an adult man, taking moderate exercise, is 14 oz., which require 37 oz. of oxygen for their conversion into carbonic acic. But it is obvious, as the inspired oxygen can be removed only by its conversion into carbonic acid and water, that the amount of food necessary for the support of the animal body must be in direct ratio to the quantity of oxygen taken into the system. Thus, a child, in whom the organs of respiration are naturally in a state of great activity, requires food more frequently, and in greater proportions to its bulk, than an adult, and is also less patient of hunger. A bird, deprived of food, dies on the third day; whilst a serpent, which inspires a mere trace of oxygen, can live without food for three months. The capacity of the chest in an animal is a constant quantity. We, therefore, inspire the same *volume* of air, whether at the pole or the equator. But the weight of the air, and consequently of the oxygen, varies with the temperature. Thus, an adult man takes into the system daily 40,000 cubic inches of oxygen, which, if the temperature be 77°, weigh 32½ oz; but, when the temperature sinks down to the freezing point (32°), it will weigh 35 oz. Thus, an adult in our climate in winter may inhale 35 oz. of oxygen, in Sicily he would inspire only 28½ oz., and, if in Sweden, 36 oz. Hence, we inspire more carbon in cold weather, when the barometer is high, than we do in warm weather; and we must consume more or less carbon in our food in the same proportion. In our own climate, the difference between summer and winter in the carbon expired, and therefore necessary for food, is as much as an eighth. Even when we consume equal weights of food, an infinitely wise Creator has so adjusted it as to meet the exigencies of climate. Thus, the fruit on which the inhabitants of the south delight to feed, contains only 12 per cent. of carbon, whilst the bacon and train oil enjoyed by the inhabitants of the Arctic regions contain from 66 to 80 per cent. of the same element. Now the mutual action between the elements of food and the oxygen of the air *is the source of animal heat.*

All living creatures, whose existence depends on the absorption of oxygen, possess within themselves a source of heat, independent of the medium in which they exist. This heat, in Prof. Liebig's opinion, is wholly due to the combustion of the carbon and hydrogen contained in the food which they consume. Animal heat exists only in those parts of the body through which arterial blood, (and with it oxygen in solution,) circulates. The carbon and hydrogen of food, in being converted by oxygen into carbonic acid and water, must give out as much heat as if they were burned in the open air. The only difference is, that this heat is spread over unequal spaces of time, but the actual amount is always the same. The temperature of the human body is the same in the torrid as in the frigid zone. But, as the body may be considered in the light of a heated vessel, which cools with accelerated rapidity the colder the surrounding medium, it is obvious that the fuel necessary to retain its heat must vary in different climates. Thus, less heat is necessary in Palermo, where the temperature of the air is that of the human body, than in the Polar regions, where it is about 90° lower. In the animal body, the food is the fuel; and, by a proper supply of oxygen, we obtain the food given out during its combustion in winter. When we take exercise in a cold atmosphere, we respire a greater amount of oxygen, which implies a more abundant supply of carbon in the food; and, by taking this food, we form the most efficient protection against the cold. A starving man is soon frozen to death; and every one knows that the animals of prey of the Arctic regions are far more voracious than those of the torrid zone. Our clothing is merely an equivalent for food; and the more warmly we are clothed, the less food we require. Were we to go destitute of clothes, like certain savage tribes,—or if, in hunting or fishing, we were exposed to the same degree of cold as the Samoyedes—we could with ease consume 10 lb. of flesh, with perhaps a dozen tallow candles, as warmly-clad travellers have related, with astonishment, of those people. Then could we take the same quantity of brandy or blubber of fish, without bad effects, and learn to appreciate the delicacy of train oil.

We may, in the above, perceive an explanation of the apparently anomalous habits of different nations. The macaroni of the Italian, and the train oil of the Greenlander and the Russian, are not adventitious freaks of taste, but necessary articles fitted to administer to their comfort in the climates in which they have been born. The colder the region, the more combustible must the food be. The Englishman in Jamaica perceives with regret the disappearance of his appetite, which, in England, had been a constantly recurring source of enjoyment. By the aid of aromatics, he creates an artificial appetite, and eats as much food as he did at home. But he thus unfits himself for the climate in which he is placed; for sufficient oxygen does not enter his system to combine with the carbon consumed; and the heat of the climate prevents him taking exercise to increase the number of his respirations. The carbon of the food is, therefore, forced into other channels, and disease results. England, on the other hand, sends her dyspeptic patients to southern climates. In our own land, their impaired digestive organs are unable to fit the food for that state in which it best unites with the oxygen of the air, and which, therefore, acts on the organs of respiration themselves—thus producing pulmonary complaints. But, when they are removed to warmer climates, they absorb less oxygen, and take less food; and the diseased organs of digestion have sufficient power to place the diminished amount of food in equilibrium with the respired oxygen. Just as we would expect from these views, in our own climate, hepatic diseases, or diseases arising from excess of carbon, are more prevalent in summer; and in winter pulmonic diseases, or those arising from an excess of oxygen.

The Professor then went on to disprove the notion, that animal food is due to nervous influence, and not to combustion—an error which had its origin in supposing that the combustion proceeds in the blood itself. He also showed, that animal heat must not be ascribed to the contraction of the muscles. The Professor proceeded to prove, that the heat evolved by the combustion of carbon in the body is sufficient to account for the phenomena of animal heat. He showed that the 14 ounces of carbon which are daily converted into carbonic acid, in an adult, disengage no less than 197 477° of heat—a quantity which would convert 24 lb. of water, at the temperature of the body, into vapour. And if we assume that the quantity of water vaporized through the skin and lungs amounts to 3 lb., then we have still 146 380° of heat to sustain the temperature of the body. And when we take into calculation the heat evolved by the hydrogen of the food, and the small specific heat possessed by the organs generally, no doubt can be entertained that the heat evolved in the process of combustion, to which the food is subjected in the body, is amply sufficient to explain the constant temperature of the body.

From what has preceded, it is obvious that the amount of carbon consumed ought to depend on the climate, density of air, and occupation of the individual. A man will require less carbon when pursuing a sedentary occupation than when he is engaged in active exercise.

Prof. Liebig, having thus discussed the source of animal heat, proceeded next to consider what are the ingredients in the food, which may properly be considered to be nutritious. Physiologists conceive that the various organ in the body have originally been formed from blood. If this be admitted, it is obvious that those substances only can be considered as nutritious which are susceptible of being transformed into blood. The Professor then entered upon an examination of the composition of blood, and of the identity in chemical constitution of fibrine and albumen. The nutritive process is simplest in the case of the carnivora. This class of animals live on the blood and flesh of the graminivora, whose blood and flesh is identical with their own. In a chemical sense, therefore, a carnivorous animal, in taking food, feeds upon itself, for the nutriment is identical in composition with its own tissues. The Professor then inquired from what constituents of vegetables the blood of the graminivorous animals is produced. The nitrogenized compounds of vegetables forming the food of graminivorous animals are called vegetable fibrine, vegetable albumen, and vegetable caseine. Now, analysis has led to the interesting result, that they are exactly of the same composition in 100 parts, and, what is still more extraordinary, they are absolutely identical with the chief constituents of the blood—animal fibrine and animal albumen. By identity, be it remarked, we do not imply similarity, but absolute identity, even as far as their inorganic constituents are concerned. These considerations showed the beautiful simplicity of nutrition. In point of fact, vegetables produce in their inorganism, the blood of animals. Animal and vegetable life are, therefore, most closely connected.

The Professor had still to account for the use of the substances in food which are absolutely destitute of nitrogen; but which, we know, are absolutely necessary to animal life. In all these we find a great excess of carbon, and very little oxygen. By a train of admirable reasoning, the Professor arrived at the interesting conclusion, that they are solely exhausted in the production of animal heat, being converted by the oxygen of air into carbonic acid and water. This portion of the Report contained an ingenious and important view of the use of bile in the animal economy, the truth of which quantitative physiology dare not deny. When exercise is denied to graminivorous animals, this is tantamount to a deficient supply of oxygen. The carbon of the food not meeting with sufficient oxygen to consume it, passes into the compounds containing a large excess of carbon, and deficiency of oxygen, or, in other words, fat is produced. Liebig is led to the startling conclusion, that fat is altogether an abnormal and unnatural production, arising from the adaptation of nature to circumstances, and not of circumstances to nature—altogether arising from a disproportion of carbon in the food to that of the oxygen respired by the lungs, or absorbed by the skin. Wild animals in a state of nature do not contain fat. The Bedouin or Arab of the desert, who shews with pride his lean, muscular, sinewy limbs, is altogether free from fat. The Professor then pointed out the diseases arising from this cause, and furnished some valuable hints to therapeutics.

From all that has transpired, we might sum up the nutritious elements of food as follow. The ingredients adapted for the formation of the blood, and which the Professor called the plastic elements of nutrition, are as follow. Vegetable fibrine, vegetable albumen, vegetable caseine, animal flesh, animal blood. The other ingredients of food, being fitted to retain the temperature of the body, he called the elements of respiration. They are—fat, starch, gum, cane-sugar, grape-sugar, sugar of milk, pectine, bassorine, beer, wine, spirits. These are Professor Liebig's general principles of nutrition.

The second part of the Report consisted of details, in which he examined the chemical processes engaged in the production of bile, of uric acid and its compounds, as well as of cerebral and nervous substance. The conclusions to which he has arrived on these subjects are of such great and startling interest, that Dr Playfair said, he dare not venture to make an abstract of them, without entering into the calculations with which they were accompanied.

In the Professor's explanatory remarks on digestion, he ascribed a singular function to saliva. This fluid possesses the remarkable property of enclosing air in the shape of froth, in a far higher degree even than soap-suds. This air, by means of the saliva, accompanies the food into the stomach; and there its oxygen enters into combination with the constituents of the food, whilst its nitrogen is again given out through the lungs or skin. The longer digestion continues, the greater is the quantity of saliva, and consequently of air, which enters the stomach. Rumination, in certain graminivorous animals, has plainly for one object a renewed and repeated introduction of oxygen. The Professor further touched upon the use of tea and coffee as an article of food. Recent chemical research has proved that the active principles of tea and coffee—viz. theine and caffeine—are absolutely one and the same body, perfectly identical in every respect. The action of tea and coffee on the system must be therefore the same. How is it that the practice of taking them has become necessary to whole nations? Caffeine (theine) is a highly nitrogenised body. Bile, as is well known, contains an essential nitrogenised ingredient—taurine. Now, Professor Liebig considers that caffeine goes to the production of this taurine; and, if an infusion of tea contain one-tenth of a grain of caffeine, still, if it contribute, in point of fact, to the formation of bile, the action even of such a quantity cannot be looked upon as a nullity. Neither can it be denied, that, in case of using an excess of non-azotised food, or deficiency of motion, which is required to cause the change of matter in the tissues, and thus to yield nitrogenised matter of the bile, that in such a condition the state of health may be benefited by the use of tea or coffee, by which may be furnished the nitrogenised product produced in the healthy state of the body, and essential to the production of an important element of respiration. The American-Indian, with his present habits of living solely on flesh, could not with any comfort use tea as an article of food; for his tissues waste with such rapidity, that, on the contrary, he has to take something to retard this waste. And it is worthy of remark, that he has discovered in tobacco-smoke a means of retarding the change of matter in the tissues of his body, and thereby of making hunger more endurable. Nor can he withstand the captivation of brandy, which, acting as an element of respiration, puts a stop to the change of matter, by performing the function which properly belongs to the products of the metamorphosed tissues.

The third part of Liebig's Report treated of the recondite laws of the phenomena of motion; but as it is principally of a speculative character, we pass it over.

The Professor concluded his valuable communication by two chapters: one on the theory of disease; the other on the theory of respiration. The whole life of animals consists of a conflict between chemical forces and the vital powers. In the normal state of the body of an adult, both stand in equilibrium. Every mechanical or chemical agency which disturbs the restoration of this equilibrium is a case of disease. Disease occurs when the resistance offered by the vital force is weaker than the acting cause of disturbance. Death is that condition in which chemical or mechanical powers gain the ascendancy, and all resistance on the part of the vital force ceases. Every abnormal condition of supply or waste may be called disease. It is evident that one and the same cause of disease—that is, of disturbance—will have different effects, according to the period of life. A cause of disease, added to the cause of waste, may in old age annihilate the resistance of the vital powers, or, in other words, occasion death; while, in the adult state, it may produce only a disproportion between supply and waste; and in infancy only an abstract state of health, *i. e.* an equilibrium between supply and waste.

Professor Liebig argued, from what had preceded, that a deficiency of resistance in a living part to the cause of waste is, in fact, a deficiency of resistance to the action of the oxygen of the atmosphere. The Professor's theory may be compared to a self-regulating steam-engine The body, in regard to the production of heat and of force, acts just like one of these machines. With the lowering of the external temperature, the respiration becomes deeper and more frequent; oxygen is supplied in greater quantity, and of greater density; the change of matter is increased, and more food must be supplied, if the temperature of the body is to remain unchanged. It has been proved, that iron is not necessary to the colouring matter of the blood, but that it forms an essential constituent of blood-globules. These globules, it is well known, take no part in nutrition. Prof. Liebig conceives that the iron is the great means of conveying to the lungs the carbonic acid formed in the system; and he has made a calculation, that the iron contained in the body could actually convey twice as much carbonic acid as is expelled daily from the system. —From *The Literary Gazette*, No 1238, in which the Editor acknowledges his obligation to the *Manchester Guardian.*

PROPERTIES OF GELATINE.

THERE has lately occurred in Paris a controversy on the use of the Gelatine of bones for hospital soup, as recommended by D'Arcet, and the most contradictory opinions as to its qualities are daily published. Professor Liebig has, we think, decided this question. He has shown that Gelatine cannot yield blood, and that by itself, therefore, it cannot support life. But he supposes that it is dissolved in the stomach, and, being conveyed in the blood to every part of the body, acts as nutriment to the gelatinous membranes and bones alone. This ingenious idea explains both how Gelatine mixed with other animal matter forms a good diet, and how it is peculiarly adapted for the sick and convalescent, in whom it acts by giving nutrition to the gelatinous tissues, and so sparing much of the energy of the enfeebled digestive system, which is thus not consumed in producing Gelatine for these tissues, but is expended in the digestion of sanguiferous nourishment. We can now readily credit the statement of D'Arcet, who has shown that in all the hospitals where the Gelatine of bones has been used as a principal, but not the only article of animal food, the patients relish it, the success of the treatment has been much increased, and the period of convalescence on the average much diminished. Now that we possess what appears to be the true theory of the action of Gelatine, it is to be hoped that the prejudice, previously very natural, which exists in this country against its use, may be overcome, and that our hospitals may participate in the benefits of D'Arcet's benevolent system, which, when successfully conducted, has likewise the advantage of superior economy.—*Quarterly Review of Liebig's new Work on Animal Chemistry.*

QUANTITY OF CARBON USED IN FOOD

DR. PEREIRA states in the *Pharmaceutical Journal* —the quantity of Carbon consumed, in the form of Food, by different individuals, is subject to considerable variation It is well known that some perons are notorious among their friends and acquaintances for being great feeders,—while others are commonly known as small eaters The difference is still greater when we compare the eating powers of the inhabitants of different countries Whether this depends, as some phrenologists assert, on the unequal development of a particular part of the brain (which they call the *organ of alimentiveness*) I shall not stop to inquire, it being sufficient for the present purpose that the existence of inequalities of appetites among different individuals is generally recognised

Liebig estimates the amount of carbon daily consumed at 15$\frac{9}{10}$ oz avoirdupois, [13$\frac{9}{10}$ oz Hessian] exclusive of that consumed in the form of green vegetables, &c His statement is based on observations made on the average daily consumption of food by from *27* to 30 soldiers, of the Body Guard of the Grand Duke of Hesse-Darmstadt, in barracks, for a month, or by 855 men for one day I have drawn up the following table from his statements, and converted the Hessian weights into avoirdupois weights

Kinds of Food	Avoirdupois weight of Food			Avoirdupois weight of Carbon		
	lbs	oz	grs	lbs	oz	grs
Ordinary meat containing ¼ of fat and cellular tissue	306	4	186	80	14	210
Fat or Lard	3	13	304½	3	1	156$\frac{1}{10}$
Lentils	3	10	412	11	10	131$\frac{2}{10}$
Peas	12	12	161			
Beans	15	0	76			
Potatoes	1093	2	357	133	5	374$\frac{2}{10}$
Bread	1923	9	214½	589	11	50½
Total for 855 men for one day	3358	5	398	818	11	47
Average for one man for one day	3	14	370½	0	15	140

In addition to the above, the 85 men consumed

	lbs	oz	grs
Of green vegetables (cabbages, greens, turnips, &c)	189	7	401½
Of sourkrout	110	2	325
Of onions, leeks, celery, &c	25	11	203½
Total for 855 men for 1 day	326	6	55
Average for 1 man for 1 day	0	6	47

It also appears, from an approximate report of the serjeant-major, that each soldier consumed daily, on an average, out of the barracks, the following quantities of other food —

Sausages 3$\frac{2}{10}$ oz } Avoirdupois weight
Butter ½ oz and 33½ grs }
Beer ½ pint
Brandy $\frac{1}{10}$ pint

So that we may fairly assume, that each of these soldiers consumed daily about one pound, (avoirdupois,) of carbon Now if we suppose that while under experiment he neither gained nor lost in weight, what, it may be asked, became of the carbon thus taken in the form of food?

I shall assume, with Liebig, that the carbon of the green vegetables, sourkrout, and onions, was equal to that of the fæces and the urine, and shall exclude from our calculation the carbon of the small quantity of food (sausages, butter, beer, and brandy) taken in the alehouse We have, therefore, to account for the disposal of 15 ozs 140 grs avoirdupois (=6702½ grs troy) of carbon, nearly the whole of which quantity must have been thrown out of the system by the lungs and the skin in the form of carbonic acid

Now, 6702½ grs troy of carbon require 17 840 grs of oxygen gas to yield 24 512½ grains of carbonic acid, and it is remarkable that Menzies estimated the quantity of oxygen consumed in respiration by a man in 24 hours at 17,625 grs

Consumption of oxygen in 24 hours

	Cubic Inches		Grs
Lavoisier and Seguin	46037	or	15661 (French)
Menzies	51480	or	17625
Davy	45504	or	15751
Allen and Pepys	39600	or	13464

If it be objected that the estimate of Menzies is too high, it may be replied, that the amount of food consumed by the Darmstadt soldiers was perhaps above the average Each of these is calculated to have eaten $35\frac{1}{4}$ ozs avoirdupois, [32 ozs Hessian,] of bread, and about 6 ozs avoirdupois, of meat (besides the 3 ozs Hessian, of sausage,) daily Now in the dietary of the Stepney Union, (which, I am assured, is considered to be a very good dietary for paupers,) the Poor-Law Commissioners allow only 14 ozs of bread, and rather more than 2½ ozs of meat, as the daily supply

Moreover, the consumption of food, and consequently of carbon, by females, is considerably less than that by the Darmstadt soldiers

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COMPOSITION OF THE BLOOD AND BONES OF DOMESTIC ANIMALS

This paper by Prof Nasse, of Marburg, has been read to the British Association The author has made an elaborate series of proximate analyses of the Blood of man, the dog, cat, horse, ox, calf, goat, sheep, pig, goose, and fowl, ascertaining the relative proportions in each of water, serum, albumen, fibrine, and fat, together also with the usual saline constituents The results of his analyses he exhibited in a series of tables, which are too extended for insertion He drew some conclusions with respect to the relation of each constituent part to the rest Thus, from purely chemical evidence, he arrives at the conclusion, that the less iron and more alkaline carbonates and fibrine which are contained in the blood, the weaker will the constitution of the animal be, and the more liable to disease Thus, the blood of the English horse contains much more iron and less alkaline matter or fibrine than the German horse; and it is well known that the blood is far less liable to disease in the former than in the latter. Prof. Nasse then examines the variation in the composition of wounded and of healthy bones. The conclusion deduced from his analysis is, that the bones of injured limbs are deficient in organic constituents, such as in their gelatine, as well as in the carbonate of lime. The proportion of phosphate of lime remains unchanged, but that of carbonate of lime is much diminished. The Professor accounted for this phenomenon from the circumstance of carbonate of lime being soluble in carbonic acid. When a limb is injured, blood thickens in the substance of the bone; and in this state it contains more carbonic acid than that which freely circulates, and would, therefore, favour its solution. The liquid taken from the injured part contains more than its normal quantity of albumen, which, under certain circumstances, favours the solubility of carbonate of lime. The thanks of the Section were given to Prof. Nasse for his communication.

Dr. Playfair drew attention to some points connected with Prof. Nasse's tables of the composition of the blood of the various animals. He, (Dr. Playfair,) had shown by some analyses in Liebig's *Physiology*, that the ultimate composition of blood and flesh was nearly identical. Hence the Professor's results might be considered as tables of the economic value of the flesh of animals, and the results agreed closely with the actual facts. Thus, according to the author of the paper, the blood of men contained 74·194 of albumen; the blood of the ox, which formed, after being transformed into flesh, the most nutritious food for man, contained 74·45 of the same body; the pig, the flesh of which was equally nutritious, contained also exactly the same as that of man—viz. 74·80 Then in those animals, the flesh of which is less nutritious, we find the proportion of albumen considerably less than in man: thus, in the blood of the goat it is only 62·905; in the goose 48·965; in the fowl 48·52.—*Athenæum*, No. 767.

EXTEMPORANEOUS PRODUCTION OF MILK.

M. Dichost, a Russian chemist, proposes the following plan for the Preservation and Extemporaneous Preparation of Milk. He evaporates newly-drawn milk, at a very gentle heat, till it is all brought to a state of fine powder. It is then put into small glass bottles, which are completely filled, and hermetically sealed, with ground glass stoppers. A small quantity of the powder thus obtained, dissolved in a proportionate quantity of water, affords on the instant a milk of very good quality. The powder will remain good for a length of time.—*Gaz. des Hôp.*; and *Brit. and For. Med. Review.*

ELEMENTS OF DIGESTION.

MM. Sandras and Bouchardat have experimented, in order to ascertain the Elements necessary for Digestion in the stomach. The authors state that the digestion and absorption of albuminous and feculous substances are performed exclusively by the stomach; whereas, greasy substances are not there acted upon, but pass into the duodenum in the state of emulsion, by means of alkalis, which are given out by the liver and pancreas. This emulsion is to be found in abundance in the whole of the intestine. The chyle appears to be the same, whether the food be albuminous or feculous; but there is a sensible difference where greasy food is taken.

PREPARATION OF OXYGEN GAS.

The substances now employed for obtaining a supply of Oxygen Gas are the black oxide of manganese and chlorate of potash; but both processes are inconvenient; the first by its great heat and expense, and the latter by its slowness and the difficulty of collection.

Mr. Marsh has, however, found the following process to answer the purpose perfectly, and to remove the major part, if not all, of the above-stated objections:—Three parts of the chlorate of potash are reduced to a coarse powder in a mortar, and then mixed with one part, by bulk, of finely powdered black oxide of manganese. Red lead, black oxide of copper, and many other substances, can be used instead of manganese; but manganese is preferable, because of its uniform action, and its cheapness, compared with these other bodies. After mixture, they are to be put into a common glass retort, or clean Florence oil bottle, to which must be attached a bent tube of metal, or glass if required. Every thing being arranged for the liberation and collection of the oxygen gas, the flame of a common spirit-lamp, or a few bits of ignited charcoal, placed in an old crucible, may now be applied; and in a few minutes the gas will be evolved, from the mixture in the retort, in great abundance. The little attention required, on the part of the operator, consists in regulating the heat; removing it for a few seconds when the gas is being expelled with great rapidity, and applying it more closely when it flags.

In this way, and by this simple alteration in the process, the oxygen is obtained with great celerity, and is under the most perfect command of the operator during the whole process; indeed, so easy is it to obtain an abundant supply of the gas in question, without loss or risk of any kind, that it resembles in simplicity and rapidity the well-known process of obtaining hydrogen by the aid of zinc, sulphuric acid, and water.

The residue left in the retort after the operation, and when cold, is easily removed by the aid of clean water; and if the salt be washed out by a plentiful supply of water, the manganese oxide, or any other oxide used in the process, when dried, may be employed again for the same purpose.

The foregoing process was first made known to Mr. Marsh, by Mr. George Southby, son of the celebrated artist in fireworks, &c.—*Communicated to the Annals of Chymistry*, No. 3.

A new process for preparing oxygen gas has likewise been suggested by Mr. W. H. Balmain. A mixture of three parts of bichromate of potash and four parts of common sulphuric acid contained in a capacious retort, will on the application of a moderate heat yield pure oxygen with a rapidity entirely at the command of the operator. This process is cheaper than that of heating chlorate of potash; for two parts of bichromate of potash will produce as much oxygen as one of chlorate of potash, while the latter is nearly three times the price of the former; besides which, the residue of the first is valuable, and may be reconverted into bichromate of potash. It is likewise, (says Mr. Balmain,) a more convenient process than any at present known, since it may be conducted at so low a temperature that an ordinary retort and lamp may be used for the production of a considerable quantity of oxygen.

In a note to the *Philosophical Magazine*, No. 135, wherein this process appears, the Editor, (R. P.) states that he has found it to answer very well, the gas being given off with greater readiness than when sulphuric acid and binoxide of manganese are employed.

APPLICATION OF BINOXIDE OF HYDROGEN IN DIVING BELLS, &c.

It occurred to M. de Sondala that by means of this compound it might be possible to maintain air in a state fit for respiration, even in a very limited space, without renewing it.

The experiments that he has already made on the subject have confirmed the supposition that the peroxide of hydrogen may be used as a source of oxygen; the regulated evolution of which from the solution will constantly furnish a volume equal to that absorbed by the action of the lungs; whilst by means of a certain proportion of hydrate of lime, contained in a receiver properly arranged, the constant absorption of carbonic acid produced during respiration may be regularly effected.—*Annals of Chymistry*, No. 3.

DILATATION OF ELASTIC FLUIDS.

Most persons are aware, who follow the course of science, that the coefficient of Dilatation of Elastic Fluids, which until a comparatively recent period had been assumed the same for every gas, and such that the dilatation was $\frac{1}{480}$ part of the volume for each degree of Fahrenheit's thermometer, has more recently been submitted to new researches by Regnault, Despretz, and others. M. Magnus is the latest experimenter in this field, and has not yet concluded his researches, which are of great value: he has, however, already ascertained that the coefficient of dilatation is not precisely the same for all gases; and that the difference does not arise from the easy condensibility of some, such as sulphurous acid, into liquids.—*Mechanics' Magazine*, No. 971.

PROTECTION AGAINST FIRE-DAMP, IN COAL MINES.

Mr. M. Scales, of Old Ford, has communicated to the *Athenæum*, No. 742, the following method. If every shaft had a gunbarrel gas-pipe, (a term of size,) fastened to the side from the mouth of the pit to the bottom, in which a small iron rod was inserted, the rod, fastened to a lever, (like a handspike,) at the top, and at the bottom to a percussion-lock, and a pistol-barrel, with a small quantity of gunpowder rammed down with tow, dipped in spirits of turpentine, or naphtha,—any one could let go the wire, whose gravity alone would discharge the pistol, which would at once ignite the "fire-damp" and cleanse the pit; so as to make it not only perfectly safe for any one to enter with a lighted candle, but wholesome for the men to work in. The same apparatus might be extended to the different gates, banks, or bords and headings of the coal-pit; the same results would take place. When the men left work, some one should be employed to load the pistols, or see that they were fired morning and evening, before the men went into the mines. The whole could be done with perfect ease at the top of the pit, and carried into every part of the mine: if the mine be very extensive, reaching several miles in various directions, there must be several stations, several levers and pistols; and the levers will have to draw in a horizontal position, instead of only letting them go, as at the top.

NEW METHOD OF PURIFYING GAS.

M. **Mallet** has had in operation for some time, at the gas-works at St. Quentin, a new method of purifying gas, which has been described to the Academy of Sciences, at Paris. The results are said to give a gas of the highest purity, free from naphthaline, which is what makes the chief part of the smoke that blackens our ceilings, in our own gas from coal; and equally free from various ammoniacal compounds, which give much of the detestable smell to coal gas when it escapes. The gas at St. Quentin, though candidly admitted by the inventor of this process of purification not to be absolutely without smell, has yet very little, and that scarcely, if at all, offensive.—*Mechanics' Magazine*, No. 971.

MANUFACTURE AND PURIFICATION OF COAL GAS.

Mr. John Davies, of Manchester, has read to the British Association, a paper on this subject. Besides the illuminating gases obtained by the distillation of coal, other gases are at the same time evolved, which are not adapted for the intended purpose. These gases are, carbonic acid and sulphuretted hydrogen. The latter is particularly objectionable, both from its offensive odour, and from other noxious properties. A volatile hydrocarbon usually accompanies the coal gas, and adds materially to its illuminating power. It is well known that its two former constituents are removed from coal gas, by means of lime; but if the purification be carried too far, the hydrocarbon is also removed. Dr. Ure had shown this in the case of olefiant gas; and Mr. Davies was able to testify to the accuracy of his experiments, and to extend the remark to other hydrocarbons, which are occasionally evolved. The best means of avoiding this loss of illuminating properties is, to employ a coal containing a smaller proportion of sulphur than usual. Mr. Davies then adverted to Mr. Phillips's patent for removing ammonia from coal gas, by passing it through a purifier containing a solution of alum. He had found it, on several occasions, perfectly successful. He then adverted to the origin of the ammonia obtained in the distillation of coal. He did not think that the quantity of nitrogen contained in coal could sufficiently account for its formation. The analyses of Regnault and Richardson have, however, shown that nitrogen is contained in notable quantity in all kinds of coal.

In the course of a conversation which followed this paper, Mr. Leigh, of the Manchester Gas-Works, stated, that as much as two ounces of muriate of ammonia exist in one gallon of gas water. Mr. West had examined many specimens of coal, and had never met one specimen free from sulphur. This sulphur was not always in combination with iron. Mr. Blyth mentioned the curious fact, that in the water of a coal mine, which he had lately examined, a large amount of silicate of soda existed.—*Athenæum*, No. 768.

COMBUSTION OF COAL.

Mr. C. Wye Williams has read to the British Association, a paper "On the Advantages and Disadvantages of Hot Air in effecting the Combustion of Coal." The chemical question now entered on was that of diffusion, which, as Dr. Dalton has shewn, took place without regard to, and in defiance of, the laws of gravitation. An increase of temperature of the air in a bladder was shewn only to increase the bulk, and not to alter the oxygen contained in it. The more the temperature was increased, the greater distance the atoms stood from each other. There was, therefore, a great mechanical difficulty in getting a large volume of hot air favourable to combustion within a given time. The conclusion Mr. Williams came to was, that when we raise the temperature of the gas, and not of the air, we do all that is necessary.—*Literary Gazette*, No. 1332.

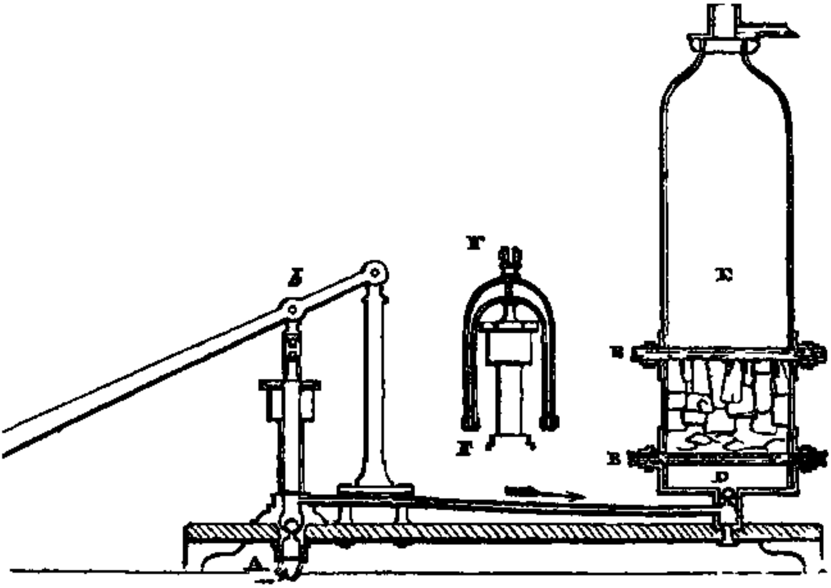
IMPURE AIR.

Dr. Reid, in his lectures on chemistry, mentions the following simple and satisfactory experiment for the discovery of impure air:—A spoonful of lime should be injected into a beer-bottle with water, and being placed where suspicion is attached to the quality of the atmosphere, the presence of impurity would be tested by the appearance on the surface of a white and copious incrustation.

NEW HYDRAULIC FILTER.

This little apparatus secures the rapid filtration of concentrated decoctions, essences, solutions of extracts, and those preparations of vegetable substances which are liable to decomposition, if exposed, for a moderate time only, to atmospheric influence. Although only occupying the space of a few inches, it is capable of filtering, perfectly bright, three gallons per hour, of a muddy, thick liquor; and, of course, a larger apparatus will filter a proportionately increased quantity.

It is admirably adapted for bleaching and filtering castor oil, withut injuring the oil; a little warmth, and pure animal charcoal as the leaching ingredient, being all that are requisite: it will serve also to ntroduce a new era in the practice of percolation, the process being *er ascensum*, in lieu of *per descensum*; since the same liquid may e rapidly and frequently passed through the ingredients, without the ossibility of clogging—an important point in exhausting opium of its oluble constituents.



A. Conducting or suction tube, through which the fluid is to be drawn.
B. Flanges which bind the filtering media; consisting, first, of a peculiarly woven thick flannel, then felt, and next another layer of flannel, with sand, glass, or filtering paper, between.
. Reservoir for the muddy deposit which will not pass the media.
Charcoal, powdered glass, or sand; or if used for percolation *per ascensum*, reservoir for ingredients to be exhausted.
. Reservoir of filtered liquid, which overflows at the top.
F. Arrangement of the slings, contrived so as to secure parallel motion in the most compact manner.

Description.—It consists of a force pump, the diameter of whose olid piston is one-sixth the diameter of the filtering media; such pump eing worked by a lever handle *a*, giving an increase of about twelve imes the power that would be obtained without such lever. Assuming he diameter of the pump to be *half an inch*, and the filtering media B B as *three inches*, this will be about twelve times the content of the ormer; and as the lever increases this power twelve times, we shall have the enormous power of 144 times the force exercised on the handle of the lever, impelling the liquid through the filtering media. If we apply, then, on the handle the force of 100 lbs., we shall have a force of 14,400 lbs. impelling the liquid through the media.

This power, which may be increased, by the application of the same principle, to any extent, no filtering media whatever can impede; we may send our liquid through columns of powders, animal charcoal, sand, flannels, felt, leather, &c., until we have either exhausted all the soluble portions of a substance, or saturated our liquid to the consistence of treacle, at the same time filtering it as bright as possible.

It is well adapted for driving water through animal or wood charcoal, to render it fit for washing precipitates, &c. A smaller apparatus, for experiment, may be constructed, using a syringe for the forcing pump.—*Communicated to the Annals of Chymistry*,* No. 6.

A Correspondent of the *Annals of Chymistry*, however, suggests that the inventor of this new filter "underrates the force with which the liquid is impelled through the filtering media. If, through the agency of a very low lever, the force applied to the piston of half an inch diameter be 1200 lbs., then the pressure on the liquid in the filter, presenting a surface of three inches diameter, will be 36 times, not 12 times, 1200; circles being to each other in the duplicate ratio of their diameters. Such calculations serve to shew the capabilities of this valuable apparatus, but the application of so great a force, (near 20 tons,) is nether requisite nor safe."

ETHER FROM ORGANIC ACIDS.

M. **Gaultier de Claubray** has succeeded in procuring Ether from Organic Acids, by the use of heat: his process is to add alcohol, drop by drop, to the hot acids.

OXIDATION OF ALCOHOL BY CHROMIC ACIDS.

Chromic acid, as well as other substances, (for instance, spongy platina,) converts alcohol into a liquid containing aldehyd, lampic acid, ethereous acid. If some dry chromic acid be thrown into absolute alcohol, it becomes suddenly red-hot, is reduced to protoxide; and, if the alcohol be only in very small quantity, it takes fire. Absolute alcohol, mixed with sulphuret of carbon, takes fire on the admission of the slightest trace of dry chromic acid; whilst sulphuret of carbon alone is scarcely affected by it. These experiments have been made with common chromic acid; that is to say, chromic acid contaminated with sulphuric acid, according to Tritsche's method.—*Annals of Chymistry*, No. 6.

PRESERVATION OF ANIMAL AND VEGETABLE KINGDOMS.

Mr. Babington has reported to the British Association the results of experiments for the above purpose commenced in June, 1838, and continued four years. They were made by placing in small jars, (5 inches by 2,) solutions in water of the different substances unmixed, but tried in three proportions: viz., 1, a saturated solution; 2, a solution diluted with an equal quantity of water; and, 3, with a double quantity. The following is a list of them, arranged according to their value as preservatives of animal substances.

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* This valuable and much-needed Journal was commenced in October, 1842.

1. Good preservatives: naphtha employed in the proportion of 1 part to 7 of water.

2. Moderately good, but the specimens soft: sulphate of magnesia, arseniate of potash.

3. Moderately good when examined in 1840, but the specimens decomposed in 1842: alum, muriate of ammonia, muriate of magnesia, nitre, sulphate of zinc, bicarbonate of potash, arsenious acid.

4. Quite useless for the purpose of preservation: sulphate of iron, sulphate of copper, sulphate of soda, sulphate of potash, carbonate of ammonia, nitrate of barytes, nitrate of strontian, nitrate of soda, muriate of barytes, muriate of lime, phosphate of soda, chloride of potash, oxalic acid, and rough pyroligneous acid.

A few drops of kreosote in water is a good preservative, but stains the specimens brown. Corrosive sublimate preserves perfectly, but hardens the substances too much. Concentrated acetic acid decomposes the skin, bones, and cellular membrane, but leaves the vessels untouched, *i. e.* preserved.

The vegetable substances are well preserved in oxalic acid, concentrated acetic acid, naphtha, and kreosote; moderately well in muriate of ammonia, nitrate of ammonia, and corrosive sublimate. None of the others appear to have succeeded; nor, indeed, is the colour of the vegetables well preserved in any case; and, on the whole, the experiments with them are far from satisfactory.—*Literary Gazette,* No. 1238.

CONSTITUTION OF THE SULPHATES.

Mr. Graham, F.R.S., has communicated to the Chemical Society, certain experiments "On the Constitution of the Sulphate as illustrated by late Thermometrical Researches," which he considers sufficient to demonstrate that no heat is evolved in the formation of double sulphates, and that their compounds are formed at once on mixing the solutions of their constituent salts, whether precipitation occurs or not. Sulphate of potash and water are, therefore, equivalent in the constitution of such salts, or *equi-calorous,* if a term may be coined to express this relation.

CRYSTALLIZATION OF SALTS.

M. **Longchamps** has published some experiments tending to show that *all* Salts expand in the act of Crystallization; and that the apparent contraction which often takes place arises from loss of heat in the solution.—*Mechanics' Magazine,* No. 975.

NEW SALT.

M. **Laurent** announces that he has obtained a New Salt, the "isato-sulphate" of potash, by treating isatine with the bisulphate of potash. This salt presents a new type of crystals: it is isomeric with the indigo-sulphate of potash, but it possesses different properties. Acids give a precipitate of isatine, and disengage sulphurous acid

NEW PLATINA SALT

During some investigations of the cyanides of platina and iridium, Mr Knopp discovered a new and very remarkable Platina Salt, with a closer examination of which he is now occupied It is procured from the double cyanide of Gmelin, and it also forms a double cyanide with cyanide of potassium It crystallizes in fine prisms, distinguished by their cupreous metallic lustre, exactly resembling metallic copper Under the microscope, however, the transparency of the crystals becomes apparent, they are tinged by a pale green colour, easily soluble in water, forming a colourless solution —*Liebig's Annalen*

[This salt has also been discovered by Professor Erdmann, as we learn from a private letter —*Note by Liebig*]—*Annals of Chymistry*, No. 2.

PREPARATION OF NOISELESS CONGREVES

According to the observations of Dr R Boettger, all Congreves which ignite with a crackling report contain chlorate of potassa The colouring matters are smalts, peroxide of lead, or peroxide of manganese. Of the materials for smouldering (touch) paper some are imbued with saltpetre, others with bichromate of potassa, and again some with acetate of lead Those containing saltpetre are to be preferred, since they furnish a more permanent glowing red light when ignited

The best proportion for the mixture of the igniting mass and which burns with the least noise, is the following —Sixteen parts of gum Arabic, nine parts of phosphorus, fourteen parts of saltpetre, and sixteen parts of vermilion Instead of gum Arabic, mucilage of Tragacanth might be employed In order to prevent the injurious influence of the oxygen of the atmosphere on the mass, it is advisable to cover the points of the matches, after being dipped and dried, with a dilute varnish of copal, or with a solution of gum containing saltpetre —*Boettger's Beitrage Annals of Chymistry*, No 6

DECOMPOSITION OF BROMATE OF POTASH BY HEAT.

According to M Fritzche, when Bromate of Potash is subjected to a high temperature in a mercury bath, the crystals of the salts decrepitate, and are reduced to powder If this powder be thrown into water, it will immediately disengage pure oxygen gas the evolution is most rapid when the temperature of the water is raised from about 160° to 175° In the opinion of the author, the bromate influenced by heat is decomposed into bromite and oxibromate, the latter being immediately decomposed by the water into bromate and oxygen gas It appears that the bromite possesses the property of readily absorbing oxygen, and reproducing bromate , for the powder, dissolved in water, and evaporated in the air, reproduces exactly the same quantity of bromate originally submitted to experiment

The production of oxibromate, under these circumstances, is a curious fact, which connects the bromate with the chlorate of potash; and the decomposition which the oxi-bromate undergoes in water explains the impossibility of obtaining oxibromate of potash in the moist way.—*Journal de Pharm. et de Chim.; Philosophical Magazine*, No. 131.

MANUFACTURE OF OIL OF VITRIOL FROM IRON PYRITES.

THE manufacture of Sulphuric Acid and Soda is carried on conjointly, in a factory at Belgium, in the following manner:—The residua of the roasted pyrites are mixed with an excess of sea salt, having previously ascertained the contents of sulphate of iron contained therein. The mixture is then heated in an appropriate furnace, arranged so as to collect the muriatic acid. The sulphate of soda formed is obtained by solution and crystallization; the peroxide of iron remaining is separated by elutriation into two parts: the most finely divided is dried and mixed with grease or palm oil, serving as a lubricator for machinery, for which it is admirably adapted; whilst the coarser portions are made into balls, dried, and used as a mineral iron for the puddling furnace. In factories where soda is not made concurrently with sulphuric acid, in place of procuring the sulphate of iron from the roasted pyrites, it will be more advantageous to distil these residua; the sulphate of iron being first dried, so as to obtain the fuming sulphuric acid of Northausen, as it is termed. It would be very easy to arrange the apparatus in such a manner that the sulphurous acid, arising from the decomposition of part of the sulphate of iron, should be conducted into leaden receivers or chambers. By such an arrangement, nothing would be lost, since the colcothar or peroxide of iron remaining after the process has been completed, is always available.—*Annals of Chymistry*, No. 13.

MANNA.

A SUBSTANCE has recently been introduced into commerce as Manna, in France, but which does not possess all the properties for which that drug is valued. It is questionable whether the new substance is an artificial or natural product; and it has been examined chemically by Pelouze, and optically by M. Biot, by means of polarized light, according to his own peculiar method.

Mannite, the peculiar proximate principle to which manna, (which is a secretion from certain trees of the genus *Fraxinus*,) owes its efficacy, has scarcely any estatory power on the polarized ray. The solution of manna, however, like that of dextrine, or starch modified by the action of acids, causes the ray to deviate to the right of the observer, which arises from its containing a quantity of fermentable sugar. This renders the optical examination of this new sort of manna not quite decisive, as its effects on light are similar. This substance consists nearly wholly of fermentable sugar, very analogous to that produced by the action of acids on starch; and although it cannot be pronounced certain, it seems not improbable that this new sort of manna is, in fact, so made.—*Mechanics' Magazine*, No. 970.

HOT SPRINGS.

On Feb. 28, M. Combes read to the Academy of Sciences, at Paris, a memoir on the Sulphureous Hot Springs of Hamman-Escoukin, near Bona, in Africa. They burst forth on a small plateau, covered by a white crust of the mineral matter deposited by their water, and they form round each orifice small cones, from the summit of which the water flows. Their average heat is from 207½ to 212° Fahrenheit—boiling point. They are highly sulphureous, and send up immense clouds of steam.

NEW PYROMETER.

Mr. C. W. Williams, in his recent inquiry as regards combustion, and the mode of producing the greatest quantity of heat from any given weight of coal, found the uncertainty as to the evaporative powers of the various kinds of boilers so great, that no reliance could be placed on the results obtained through their means. He, therefore, concluded—that in treating experimentally of the furnace and its management, particularly as regards the admission of air, the furnace alone, and its heat-generative powers, must be tested, and apart from the boiler.

To ascertain this heat-generative economy, Mr. Williams suggested three modes. 1. By means of thermometric bars, the heat being conveyed to the thermometer by the conducting power of the metallic bar. 2d. By the use of a series of metallic alloys, introduced into the flues, and which, being fusible at varying and ascertained temperatures, would indicate the temperature existing in the flue. 3d. By means of a Pyrometer constructed of a number of metallic bars, united by a system of compound levers, the expansive power of the bars being transferred to an index placed outside the boilers.

At the meeting of the British Association, Mr. Henry Houldsworth described his very simple and useful Pyrometer. He is reported to have said, that "he had that morning fitted up a contrivance for ascertaining the comparative temperatures of the flues under different circumstances which had not been very satisfactorily ascertained. Mr. Williams had used a thermometer, inserted in a bar of iron," (copper,) "which was placed in the flue; but he (Mr. Houldsworth) was not satisfied with that plan, and had passed a copper wire through the flue from one end to the other. This was kept in a state of tension by weights, and by its expansion or contraction acted upon an index, which gave a very correct measnre of the relative temperature. He had made some experiments with it, and had obtained very satisfactory results."

At a subsequent meeting of the Association, Mr. Houldsworth said, that, "Since the discussion on this subject he had made some careful experiments with the Pyrometer, which he then described; and the results were, in his judgment, exceedingly satisfactory and conclusive.

These experiments were made upon a furnace fitted up according to Mr Williams's patent, by putting three cwt of coal upon the fire two different times, the fire being each time in the same state, and the temperature of the flue, as indicated by the Pyrometer, being in each case about 700 degrees On one occasion, the air passages were left open, in the other they were closed, in each case, the experiment was continued for 100 minutes. In the experiment in which the passages were left open, the average temperature of the flue was about 1,100 degrees, in that in which the passages were closed, and Mr. Williams's apparatus thrown out of use, the temperature averaged only about 900 degrees During the whole time of the former experiment, there was an entire absence of smoke, during great part of the latter, the flues were filled with smoke Mr Houldsworth exhibited a diagram, showing in a very striking manner the results of his experiments"

So sensible was this Pyrometer, (states Mr Williams,) that it registered the degree of cold produced by the mere opening of the fire-door Mr Houldsworth also stated, that he tested the effect of admitting or excluding the air every five minutes, and on each occasion the lowering of temperature in the flue by closing the air aperture was rapidly indicated by the Pyrometer A remarkable proof of the rapidity with which this Pyrometer indicates the change of temperature in the flues, is shown in the diagram On the charge of 3 cwt. of coal being thrown on the furnace, much carburetted hydrogen gas is of course evolved If air be so admitted as to effect its combustion, a large flame is instantly produced, and a corresponding heat. But, if the air be excluded, the gas is converted into smoke, and the temperature in the flues rises but gradually These two changes of a sudden elevation of the temperature in the one case, and a slow one in the other, are strikingly marked in the diagram, from the starting point So again, when, at the end of 75 minutes, as marked on the first experiment, (see the upper line,) when the fuel is levelled on the bars and the air prevented rushing up in too large masses, the temperature rises suddenly, above 100 degrees about two minutes, whereas, in the second experiment, it rises very slowly on the fuel being levelled at the end of 70 minutes, namely, 100 degrees in 15 minutes A study of this diagram will explain many important features in the management of fuel in a furnace, and Mr Houldsworth has conferred a great advantage by thus giving so practicable a means of ascertaining what hitherto has been beyond our reach — Abridged from the *Mechanics' Magazine*, No 988, which see for the Diagram, and further details, also No 991.

NEW PRODUCT FROM COAL NAPHTHA.

THIS substance has been described by Mr Leigh to the British Association. It was obtained in the course of some investigations on an oil which Mr Leigh discovered about three years and a half ago, as the result of a mixture of nitric and sulphuric acids on purified Coal Naphtha. In their behaviour with potassa, both in aqueous and alcoholic solution, the crystals now brought under the notice of the Section by Mr. Leigh have much analogy with the oil, (like that of bitter almonds,) obtained at the same time with them. The oil, when extensively exposed to the action of oxygen, becomes a crystalline solid, having much the same appearance as these crystals. It is probable the crystals differ from the oil in containing a quantity of oxygen.

HÆMATOXYLIN.

Dr. Schunk has read to the British Association, a paper "On Hæmatoxylin, the Colouring Principle of Logwood," by Prof O. L. Erdmann, of Leipsic. The Hæmatoxylin used by the author in his experiments was prepared by the process of charcoal. In a state of purity, hæmatoxylin is not red; it is in itself no colouring matter, being merely a substance capable of producing colouring matters in a manner similar to lecanorin, orcein, or phloridzin. The colours which it produces are formed by the simultaneous action of bases, (particularly strong alkalies), and of the oxygen of the atmosphere By the action of these it undergoes a process of eremacausis, which, after forming colouring matters, ends in the production of a brown substance resembling mould. The colour of hæmatoxylin varies from a pale reddish-yellow to a pale honey colour. The crystals are transparent, possess a strong lustre, and may be obtained a few lines in length. Their form is a rectangular four-sided prism, sometimes with a pyramidal summit The taste of hæmatoxylin is similar to that of liquorice With excess of ammonia, it forms what the author calls Hæmatein, analogous to orcein, &c

NEW COMPOUNDS OF KAKODYL.

Mr Croft has read to the British Association, a paper, "On Kakodylic Acid, and the Sulphurets of Kakodyl," by Prof Bunsen, of Marburg, in which are examined the higher stages of oxidation of Kakodyl, and the sulphurets corresponding to them The Professor finds that, by the oxidation of alkarsin, either by the direct action of the air, or by means of oxide of mercury, kakodylic acid is formed, but there is also an intermediate oxide, which cannot be obtained in a state of purity, which seems to be similar to the hyponitric acid, and to be a combination of kakodylic acid with the oxide. Kakodylic acid crystallises out of alcohol, its composition is $C_4\ H_6\ As_2\ O_3 + HO$, this atom of water being constitutional, and only to be replaced by a base, it is soluble in water, but not in æther. A very remarkable fact with respect to this body is, that the poisonous properties of the arsenic seem totally annihilated eight grains administered to a rabbit exerted no poisonous action. Kakodyl combines directly with sulphur, forming the protosulphuret which has been already described. This compound takes up another atom of sulphur, and produces the bisulphuret There appears also to be a tersulphuret analogous to kakodylic acid; Prof. Bunsen has not, however, been able to obtain it in a pure state. From the above results, it appears, that kakodyl is precisely similar in its behaviour to some simple metals, and the formation of kakodylic acid by direct oxidation is in exact opposition to Dumas's theory of substitution.—*Athenæum, No.* 768.

LACTUARIUM.

A REPORT has been made to the Academy of Sciences, at Paris, on a paper on Lactuarium, by M. Aubergier, of Clermont Ferrand. When an incision is made in the stalk of the lettuce, at the time of the plant being in flower, there exudes a milky juice of great bitterness, and which dries rapidly as it comes in contact with the air—this is called *lactucarium*. In its properties, although in a milder degree, it resembles the juice of the poppy, and is considered a valuable sedative in medicine, being free from the constipating properties of opium, and never occasioning the cerebral congestion which frequently results from the use of that drug. On account, however, of the difficulty of obtaining by incision the quantity required, the lactucarium is seldom administered in its genuine state; and there is substituted for it an extract of lettuce, which is made, as with other plants, by decoction and evaporation. M. Aubergier, who with great reason thinks that the exuded juice must be in every respect preferable to this substitute, has turned his attention to the practicability of obtaining the true product in sufficient quantities to bring it within the reach of the public at large, and he appears to have succeeded entirely by a proper selection of the soil in which the plant was grown. He tells us, that if proper care be paid to the cultivation of the lettuce, there may be obtained by a single person not less than 300 grammes of the desiccated juice in one day by incision.

NICOTINE.

THIS substance was discovered by Vauquelin in 1809. M. Barral has obtained it in a state of purity, and has analysed it. He finds it to be a powerful alkali, under the form of a liquid, with a very low equivalent, and, therefore, capable of great saturation, as compared with other vegetable alkalis. It is also a very energetic poison: a single drop placed on the tongue of a middle-sized dog, killed him in three minutes.

DETECTION OF POTATO STARCH.

POTATO Starch is most easily detected in arrow-root by hydrochloric acid. Mixed therewith, genuine arrow-root gives no odour whatever; adulterated with potato starch, a smell of fresh beans or rushes may be perceived.—*Herr Ulex; Annals of Chemistry*, No. 9.

PREPARATION OF QUINA AND CINCHONIA.

M. F. C. CALVERT, *Préparateur du Cours de Chimie appliquée au Jardin des Plantes, à Paris*, has communicated to the *Philosophical Magazine*, No. 137, a new chemical fact discovered by him, relating to the extraction of Quina and Cinchonia from cinchona bark; by the knowledge of which, (he believes) the process usually followed by the manufacturers of these alkaloids may be considerably improved We have not space for details his conclusions are—first, that in the preparations of quina and cinchonia, lime should be replaced by soda, carbonate of soda or potash may be employed, but they have the inconvenience of dissolving part of the cinchonia. Secondly, that in the case of a quantitative anlaysis being undertaken, the same alkali alone should be employed to precipitate those bodies. Thirdly, that in the case of quina being supposed to be adulterated with the sulphate of cinchonia, and that it may be wished to ascertain the extent of the adulteration, the tests upon which reliance can be placed, are first, chloride of lime, secondly, chloride of calcium, thirdly, lime water, and fourthly, ammonia and carbonate of ammonia

FLOATING BRICKS.

BRICKS, which floated in water, are mentioned by Posidonius, Strabo, and Vitruvius Pollio, as having been made of an aluminous earth found in Spain, for building, on account of their lightness. Pliny also mentions a pumice-like earth as possessing these properties.

In the year 1791, an Italian, Giovanni Fabroni, formed bricks from a siliceous earth which occurs near Santafiore, in Tuscany, and they were of such lightness that they floated on water They also completely resisted the softening effects of water, and were such bad conductors of heat, that they might be held by one end in the hand, whilst the other was red hot

At that time, M Faujas likewise observed a peculiar species of earth near Coiron, in France, not far from the Rhone, and Fabroni, when present at Paris, found that this latter had precisely the same properties as the mountain dust which he employed in Italy for the purpose of forming the before-mentioned light bricks

In the year 1832, the Count Français de Nantes reminded his countrymen of the discovery of Fabroni, through the medium of the *Journal des Connaissances*, adding, "Il est fort à souhaiter que l'on cherche, et que l'on decouvre en France, cette substance blanche et pulverulente commune en Toscane, et connue sous le nom de Farine fossile Avec cette poussiere on fabrique des tuiles inalterables et eternelles, qui surnagent sur l'eau, et je puis en montrer quelques unes qui furent faites il y a deux mille ans"

In consequence of this, M Tournet, of Lyons, published in the same year a paper, "Notice sur la silice gelatineuse de Ceyssat, près de Pont-Gibaut, departement de Puy de Dome, et sur son emploi dans les Arts," showing the quality of this earth with the Italian, and confirming the properties stated by Fabroni, and its technical utility and importance

M Tournet found that bricks, formed of this earth and baked, may easily be divided with a knife, and, therefore, may well serve as moulds for casting metal, since the cast may easily be detached, and the moulds made of any size. He further recommends this siliceous earth for use in glass-works, instead of sand, as it saves fuel, and also for porous cooling vessels in hot climates, as they may easily be purified by heating to redness. Coated with tallow or wax, these stones floated on the water. He further adds; "It will easily be perceived what great advantages so light a substance may yield to the navy. The powder-magazine, the kitchen, *the hearths of steam-engines*, places where spirits are kept, and those where red-hot balls might by any possibility enter, may be secured by them. It is of equal importance for the arched roofs of melting furnaces, and all furnaces where a high temperature is required, as the bricks do not melt, and contract only very slightly."

Afterwards, Count Montlosier also found this earth on his estate of Prandamme, and Signor Leopoldo Pelli-Fabroni, at Florence, in the year 1838, directed the attention of the public again to the application of this incombustible earth. Besides this, it appears that the same material has been for a long time used in Greece, as the royal collection of minerals at Berlin contains a quantity of this mountain flour, from the collection of the late chymist Klaproth, labelled Πλακοφουρνο, obviously signifying "furnace-mortar."

This species of earth was generally considered as inorganic, and being discovered fortuitously, its technical use could not extend very far.

M. Ehrenberg has in his possession the most celebrated of these different earths of Italy, France, and Greece, and for several years has been occupied in submitting them to rigid examination. He communicated, in the year 1836, to the Academy that the earths from Santafiora, Ceyssat, and Zante, owe their peculiarities to the fact of their being an accumulation of small siliceous shells from invisible infusoria. The recent progress in the knowledge of the influence of infusoria directed his attention to their technical application; and as the utility of the infusorian clay (λῆ ἀρλιλώδηρ) has been recommended by many practical men, the writer thinks it proper to advert to the occasion which arises in this metropolis (Berlin), as well as may probably occur in all the subfluvial basins and low shores of Germany, and perhaps of other countries, to examine, in a scientific manner, with a view to the practical application of the same.

The very thick layer of infusoria underneath the houses at Berlin, on the borders of the Spree, is, when recently dug out, of a silver-grey, when dry, white, like pipe-clay, of the same quality as the Italian and the French, but considerably thicker and more extensive. With the kind assistance of the director of the Royal Porcelain Manufactory of Berlin, Mr. Trick, the writer caused some bricks to be prepared, samples of which he presented to the Academy. A common brick weighs from seven to eight pounds and upwards; a brick from the Berlin infusoria clay weighs less than two pounds; coated with wax, it floats on water like cork. The strongest fire of a porcelain furnace does not melt them, and only contracts them slightly. By the addition of some clay or loam, their solidity becomes equal to that of common bricks, perhaps even superior, whilst their weight is not increased to half their density Their further use for polishing, moulding, lining fire places, especially those which are exposed to a strong heat, for fire proof walls between houses, for constructing stone fire-proof rooms, or foundations in vessels, or for vaults and covers inside buildings which are required to be of moderate weight, may perhaps soon bring them into use, to a certain extent, in Germany, Sweden, Finland, and the North of America, if judiciously applied —*Ehrenberg, in the Ber. d Berliner Academie.—Annals of Chymistry*, No 10

ARTIFICIAL PREPARATION OF RUBIES AND EMERALDS.

Hydrate of alumina, recently precipitated and well washed, is moistened with a few drops of neutral chromate of potassa, and kneaded so that the mass assumes a tinge scarcely perceptible, it is then rolled out into small sticks, about the thickness of a finger, and slowly dried, taking the precaution to fill the fissures that form during desiccation with fresh hydrate of alumina When perfectly dry, one end of these sticks is brought into the termination of the flame of an oxyhydrogen blowpipe, until a portion of the mass is fused into a small globule Boettger, to whom we are indebted for these results, observed, after the lapse of a few minutes, certain minute balls of several millimetres diameter, of such intense hardness, that quartz, glass, topaz, granite, could be easily and perceptibly scratched therewith When cut and polished they appeared, however, slightly opaque By employing nitrate of nickel in lieu of chromate of potassa, green-coloured globules, resembling the emerald, were obtained —*Annals of Chymistry*, No 3

PARISIAN DIAMONDS

Those beautiful imitations of the "priceless gem," which have lately attracted so much attention, are made by a chemist in Paris, and are only the oxide of tin It is to be regretted that the brilliancy which has rendered this imitation so famous cannot be depended upon, for after exposure for some time, they become as dull as common glass —*Mining Journal*

PROTECTIVE PAPER

A Commission of the French Institute has been, for a very long period, endeavouring to provide methods of making Safety Paper, for stamped documents, *(papiers de surete)* A great variety of propositions have been offered to them some depending on the impregnation of the paper with matters actable on by ink, or other fluids, others on wire marks, &c, in the substance of the papers, and others (the most numerous) on the production of inks which shall be indelible Amongst the latter, Braconnot, whose name is familiar as a chemist, has produced apparently the best ink, but the Commission, until very recently, had received no plan which it considered as meeting all the conditions of the question The problem is, however, said at length to be almost, if not altogether solved by MM. Knecht and Zuber: they have produced a paper, which is made by machinery, with a wire-wove mark, in endless sheets; and at the moment of its manufacture, (before it leaves the machine,) is printed all over with an open pattern in common writing ink, without any thickening or mixture; thus, any agent used to destroy writing in common ink upon it, will destroy this pattern too. The paper is further protected from erasure by embossing, and by engraved vignettes, printed all by the paper-making machinery, or actuated by the same train. This last method is obviously founded on the principle that no writing fluid for ordinary use can be found, capable of being discharged by any agent that will not also affect common ink; and this is, probably, true.—*Abridged from the Mechanics' Magazine*, No. 975.

BEAUTIFUL AND PERMANENT RED INK.

It is well known that a solution of carmine in caustic ammonia gives a fluid of a very beautiful tint. The author of this paper recommends the following proportions:—

Pure Carmine	12 grains.
Solution of Ammonia......	3 ounces.

Place the carmine in a porcelain vessel; pour thereon the solution of ammonia; heat over a spirit lamp for a space of 5 to 8 minutes, carefully managing the temperature so as not to boil; and to the solution thus formed, add, continually stirring—

Powdered Gum Arabic.............. 18 grains.

When dissolved, the ink is ready for use. After using, the inkstand must be well closed. Instead of using carmine, which is expensive, drop lake, (being a mixture of carmine precipitated with alum,) may be employed; since the ammonia redissolves the carmine therefrom, and leaves the alumina.—*Buchner's Repert.; Annals of Chymistry*, No. 3.

NEW BLUE INK.

It has only been lately ascertained what substances are capable of dissolving Prussian blue. It has been discovered that oxalic acid is capable of effecting this. In order to prepare this Ink, six parts of pure Prussian blue must be carefully triturated with one part of oxalic acid and a little water, so as to form a very fine paste, perfectly free from grittiness; this paste is then diluted with distilled or rain water, until the proper tint is obtained, which may be ascertained by writing on paper with a quill pen: a little gum may be added to prevent the solution from running.—*Mohr; Annals of Chymistry*, No. 3.

NEW AND EASY METHOD OF ANALYZING SUGAR, BY DR. DALTON.

The new method of analyzing sugar is this. Dr. Dalton exposed 100 grains of sugar for half an hour to a heat of 270° or 300° Fahrenheit: it was beginning to become fluid about 2— grains; but the rest was solid, and a little browned. The Doctor has a bottle that holds 572 grains of water up to the neck, and a nicely-ground stopper, so as to be wiped clean and dry: this is to be filled with distilled water, and then poured into a convenient glass with a spout to it, that it may be reconveyed into the bottle again. One hundred grains of double-refined sugar, carefully weighed, are to be poured into the glass, and stirred about with a very slender stick of glass till it is all dissolved. It is then to be reconveyed into the bottle, taking care that there is not a drop lost; a little dexterity is required, but it is easily managed; the glass rod is to be regarded, and the best way is to stroke the glass rod till it is clean and dry. Then the remainder is to be poured into the narrow tube, and the number of grains is next read off. The narrow tube is to measure the grains of water and sugar overplus, or water itself, which is the same measure. The Doctor generally used 100 grains for the prime experiment.

100 sugar grains, dissolved in
572 water grains,
——
gave 672 grains by weight.
In specific gravity bottle 606 grains.
In narrow tube 66 grains.
——
672 grains by weight.

The specific gravity bottle did not vary more than 606 or 607, or one grain at most. It was long known that sugar was disposed to resolve itself solid and liquid. The solid part is charcoal, and the liquid part is water. 100 grains of sugar in 572 water were exhibited crystallized; it is very differently crystallized, and yet is the same weight as before; 100 East India sugar has a superabundance in charcoal half a grain; 100 West India sugar has also a superabundance of charcoal one grain. The Doctor concluded this paper, by giving the atoms which form sugar, tartaric acid, acetic acid, vivic acid, and citric acid. The *experimentum crucis*, after all, is in the following example:—Take 100 grains of sugar, dissolve it in 100 water, which will just melt it, (after stirring about a while with a small glass rod); then pour it out into a glass measure of upwards of 160 grains; it will be found 157 grains precisely. The 57 grains of pure water have arisen out of the sugar, and the 43 grains remain in, buried invisibly in the pores of the water. This follows, as all solid bodies remain in fluids, adding to the weight and not to the bulk of them, as previously explained.—*Proceedings of the British Association*; *Manchester Guardian.*

UNROLLING AN EGYPTIAN MUMMY.

A MUMMY, presented to the Natural History Society, of Shrewsbury, by the late Dr. Butler, was unrolled on September 15, by Mr. Birch, of the British Museum. The outer coffin in which the mummy was deposited, announced that it contained the body of "TENNOREN RHONS, PRIESTESS OF AMON," who was "DEDICATED TO O SIRIS, PRESIDING IN THE WEST, LORD OF ABYDOS, THAT HE WOULD GIVE OFFERINGS FOR THE SAKE OF THE DECEASED." The Lecturer began at the feet of the corpse to untie the linen bandages which enveloped it. These consisted of several hundred pieces, of the hue of wash leather, but capitally woven cloth, and in some parts not much discoloured, and pretty strong. On one of the pieces was an inscription, stating the age of the mummy to be 21 years. On unlapping the bandages round the neck, the head fell off, and was found quite perfect, several of the teeth in the front being still fixed in their sockets. The eyes were removed, and their places supplied by rolls of saturated linen. The cartilages of the ears were perfect, the dried flesh having the semblance of dark gingerbread. The embalmers had dipped the body into the hot bitumen so long and so frequently as to destroy the flesh, and render the skin and its envelope one mass. Gradually, however, the toes appeared, all perfect, except the nails—the feet being small and very attenuated. The muscles and skin of the legs, and the cap of the knee, next became visible, and the hands crossed on the abdomen were traced after great labour. The hip-bones, the shoulders, and the ribs, were exposed, one after the other, till at last, the fully-developed frame of a human being, 3,000 years old, lay exposed to the gaze of the company.—*Abridged from the Shrewsbury Chronicle*, Sept. 16.

IMPROVEMENTS IN BREWING

MR. SEPTIMUS PIESSE, in a paper read to the Chemical Society, on Feb. 15, suggests that the weight of extract from malt may be increased simply in adding diastase to the second wort, to convert the remaining starch into sugar. This is done by the addition of a portion of the malt, (which contains diastase) previous to mashing a second time. In a brewing of thirty quarters, Mr. Piesse would take twenty-nine quarters for the first mash, and add the remaining quarter to the second, and there would be such an increase as to warrant him in advising its adoption by all brewers and distillers.

Another improvement is recommended by the author, to prevent the absorption of oxygen by the wort, and thus, in a great measure, prevent acidity. The wort, as it flows from the tun, passes into the underback, where it is exposed to the air, and that for some time, because the wort must run slowly in order to become bright. The improvement consists in having a float in the back, that is, a surface of wood, the size of the bottom of the back, upon which it rests when empty. As the wort runs into the back, the float rises with it, and falls again when it is pumped up to the copper, thus effectually keeping it out of the contact of air previous to boiling, when the danger ceases. When this precaution has not been taken, Mr. Piesse has invariably found the wort to indicate more or less acid, which may be looked upon as likely to lead to sour beer.

ARTIFICIAL YEAST

MR. FOWNES, in a paper on the Preparation of Artificial Yeast, read to the Chemical Society, on March 15, states: "In one experiment, the following materials were used:—a small handful of ordinary wheat-flour was made into thick paste with cold water, covered with paper, and left seven days on the mantel-shelf of a room where a fire was kept all day, being occasionally stirred; at the end of that period, three quarts of malt were mashed with about two gallons of water, the infusion boiled with the proper quantity of hops, and when sufficiently cooled, the ferment added. The results were, a quantity of beer, not very strong, it is true, but quite free from any unpleasant taste; and at least a pint of thick barm, which proved perfectly good for making bread.

Mr. Fownes considers that this simple plan would enable distant residents in the country, and settlers in the colonies, to enjoy the luxury of good bread when a little malt could be got—a very easy home manufacture from grain of any kind: the hops might, probably, be omitted when the yeast alone was the object.

DISCOVERY OF A NEW METAL.

Prof. Poggendorff, in his *Journal*, notices the discovery of a new metal "it has been named *Didym*, it always accompanies Lanthanium, from which it has not yet been separated. All the researches on Lanthanium, as well as those on Cerium, are erroneous."

IS GRAPHITE THE METAL OF CARBON?

Prof. Hausmann, of Gottingen, has received from Prof. Wohler a remarkable variety of Graphite from Ceylon It is of the foliated kind, of thick columnar structure, and shows in some places a tendency to individual crystalline development. In the two pieces of the specimen, the length of the columnar portions is two Parisian inches. They are partly straight and uniform, partly bent. The pieces are bounded by parallel surfaces, in regard to which the columns are either placed at right angles, or somewhat obliquely placed; and it is not improbable that they were obtained from a vein The individual columns afford longitudinally an extremely perfect cleavage, to the smallest lamellæ. By inserting the knife in one end of the columns, thin strips may be taken off the whole length, which retain their continuity, and become bent in a curved manner, just as bark may be pealed from a young branch. The breadth of the folia depends on the size of the distinct concretions, and generally measures from a half to two lines. The cleavage surfaces have a high lustre, and are quite brilliant; and when examined under a lens, they sometimes show lozenge-shaped perpendicular fissures, that seem to indicate concealed cleavages, which cut the principal ones at right angles, and have previously been noticed in graphite. By placing one of the separated folia on an anvil, it can be made somewhat thinner and larger by hammering, which property, (not, Prof. Hausman believes, hitherto observed,) in combination with the perfect opacity of its thinnest folia and its electrical characters, afford a new proof in favour of Karsten's opinion, that graphite is to be regarded as the metal of carbon. According to the experiments of Prof. Wohler on this foliated graphite, it can scarcely be burnt by means of oxygen gas, although the diamond itself is consumed in this way; and it does not of itself continue in the least to burn in the gas It appears to leave no ashes —*Studiens des Gottingschen Vereins Jameson's Journal, No* 63

SEPARATION OF GOLD AND PLATINA

MR KEMP has found that oxalic acid reduces the solutions of Gold, and has no action on those of Platina To separate these two metals, therefore, and to determine their quantities, a solution may be made in aqua regia, and the gold precipitated by oxalic acid in the metalic state, and the platina by formic acid The difficulty of separating these two metals, which has hitherto existed, renders this process of considerable importance —*Journal de Pharmacie, Philosophical Magazine,* No 129

PECULIAR CONDITION OF IRON

PROF SCHŒNBEIN has read to the British Association, a paper "On a Peculiar Condition of Iron," in which the learned author continues his researches upon the different effects produced by iron in its active and passive states Without a detailed description of the apparatus employed in the production of the singular phenomena observed by the Professor, and which our space will not permit us to give, it is impossible to make the phenomena themselves intelligible They are intimately connected with the curious fact, discovered by the author, of the property which iron possesses with respect to oxygen *i e* in certain conditions to be an oxidable, in others, a non-oxidable, metal

ANALYSIS OF CAST IRON

DR URE has read to the British Association a paper descriptive of "A new method of Analysing Cast Iron and other Metallic Carburets" The method proposed by Dr Ure is similar to that of Regnault and Dr Bromeis, with the exception that he employs pure chlorate of potash in the combustion, instead of a mixture of that salt with chromate of lead, and collects the resulting carbonic acid in a peculiar pneumatic apparatus, filled with diacetate of lead, instead of the potash apparatus of Liebig

PROTECTION OF IRON BY ZINC

M DE ALTHAUS, director of the salt-works of Durrheim has succeeded in protecting completely the evaporating pans of the works, 30 feet in length, by nailing to them on the outside bands of zinc, and he observes that it is not necessary for the two metals to be nicely polished at the points of contact —*Annales des Mines*

NEW DISCOVERY OF SELENIUM

THE large quantities of sulphurous acid which were formerly lost during the process of roasting the ores of the Rammelsberg Ocre Works, (one of the richest parts of the Harz mountain in the north of Germany,) have been for some time employed for the manufacture of sulphuric acid. From the lead-chamber at Ocre, in the course of last year, about 300 cwt of sulphuric acid was thus produced. In the first compartment of the lead-chamber, a very delicate, reddish, slimy matter is found, consisting partly of the volatile components of the ores, mechanically carried over, and partly of products created by the action of the sulphuric acid thereon Professor Otto received from Harzburg a sample of this slimy matter, with this remark,—" that the smell which it evolved under the blowpipe indicated traces of Selenium On analysis, this remark was confirmed From 500 grammes, Prof. Otto obtained about 200 grammes, (or 4 per cent) of selenium, wherefore, this slimy compound may be considered as a new and interesting source of this rare element, which Berzelius, as is well known, discovered in like manner in the slimy products of a sulphuric acid factory at Gripshelm One of the results of Prof. Otto's numerous experiments is the weakening of his early opinion, that selenium should be placed in the series of non metallic bodies, by the side of sulphur "I endeavoured," adds Prof Otto, " to precipitate this metal, (quicksilver,) by means of copper from the solution of selenious acid containing quicksilver but found that the selenium was separated by the copper in preference to the quicksilver " *Liebig's Annalen Annals of Chymistry*, No 6, which see for details of the experiments.

ARTIFICIAL MAGNETIC OXIDE OF IRON

MR T S THOMSON has communicated to the Chemical Society, the following process of preparing the Artificial Magnetic Oxide of Iron, derived from the letters of Mr John Mercer, of Manchester

" Take a quantity, say one pound of the common crystallized proto-sulphate of iron, dissolve it in water, and add nitric acid in sufficient quantity to per-oxidise it, and afterwards carefully expel all excess of nitrous or nitric acid by boiling To this add one pound of proto-sulphate of iron, with water sufficient for its solution Pour the mixture into a solution of caustic potash, sufficient in quantity and strength to decompose the whole, and then boil The precipitate thus thrown down consists of a mechanical mixture of the protoxide and per-oxide of iron, atom to atom, raise the temperature of the mixture to 212° Fahr, and then chemical union will be effected That such is the succession of changes is proved by dipping into the mixture, previous to boiling it, a piece of clean cotton cloth, which, after exposure to the air for a few minutes, and washing in water, will exhibit the buff stain peculiar to per oxide of iron, precipitated upon cotton fibre But if this be performed after the boiling, a dirty black stain will be obtained, indicating the formation of the black oxide."

Mr Thomson adverts to the application of the artificial magnetic oxide of iron, either in a dry or moist state suspended in water, as a substance well adapted, from its extreme susceptibility of magnetic influence, to indicate the direction of magnetic or galvanic currents, the magnetic curve described by Brewster being beautifully exemplified by the use of this oxide.

COATING AND COLOURING METALS.

Mr W. H. F. Talbot has patented the following "Improvements in Coating or Covering Metals with other Metals, and in Colouring Metallic Surfaces"

These improvements are four in number —

1. Adding gallic acid to the metallic solutions intended to be precipitated Any convenient solution of silver, gold, or platina, is taken, and to each of them is added a solution of gallic acid in water, ether, or alcohol, (the last being preferred) Into any one of these mixtures, a clean bright plate of metal is immersed until it becomes coated with silver, gold, or platina, as the case may be. A weak or dilute solution is recommended to commence with, and afterwards a stronger one The acid need not be pure.

2 Silvering metallic surfaces Freshly precipitated chloride of silver is dissolved in hyposulphite of soda or any other liquid hyposulphite Into this solution, a clean bright plate of metal is immersed, and becomes very quickly coated with bright silver coating To obtain thicker coats of metal, a galvanic battery is employed, using one of the liquids before described, and taking for one of the poles a piece of metal of the same kind as that intended to be precipitated.

3 Ornamenting surfaces of brass or copper by first gilding them partially, according to some pattern, and then washing them over with a solution of chloride of platina, which gives a dead black appearance to the rest of the surface, and enhances the brilliancy of the parts gilt.

4. Colouring polished surfaces of copper by exposing them to the vapour of sulphuretted hydrogen, or of any of the liquid hydrosulphurets, or to the vapours of sulphur, iodine, bromine, or chlorine, or by dipping the metal into liquids containing them.

The claim is to the use of gallic acid, or any liquid containing it, or any analogous vegetable substance, for facilitating the precipitation of metals upon other metallic surfaces and coating them therewith, to the use of hyposulphite of soda for the silvering of metals, and the employing a galvanic battery for obtaining thicker deposits of silver, gold, or platina, but only when used in conjunction with one of the liquids before described, and to the colouring of copper surfaces by exposing them to the chemical action of the above-named substances

HYDROGEN ANNOUNCED TO BE A METAL.

At the termination of his fourth lecture at the Sorbonne—the subject being Hydrogen—M Dumas announced the following striking views —"Whatever it may cost me, gentlemen, in thus giving my opinion, I ought to express it fully. We ought no longer to consider hydrogen as a metalloid, or as merely approaching to a metal in any form it ought to be classed by the side of metals or among metals. *It is a gaseous metal, even as mercury is a liquid metal* If we suppose that it is impossible to liquify the vapour of mercury—that it is colourless, inodorous, and transparent as hydrogen—we shall have a correct idea of the views I wish to establish. By degrees, you will learn to appreciate the correctness of this new theory when, for instance, you study the different compound bodies of which hydrogen is a constituent. The *ensemble* of its properties approaches, in fact, to mercury and potassium.—*Echo du Monde Savant*, Nov. 20, 1842.

TESTS OF POISON.

On May 9, were submitted to the Academy of Sciences at Paris, by M. Jacquelain, experiments relative to the purification of various chemical substances employed as Tests to detect the existence of Poison, &c. The author has shown that zinc and sulphuric acid, which it has been supposed must be more or less impure, may be obtained in a pure state.

DIFFERENT EFFECTS OF ARSENIC ON DIFFERENT PERSONS.

At the conclusion of an inquest held in October, before Mr. Wakley, M.P., relative to the death of a party suspected to have been poisoned by Arsenic, or some other corrosive poison, the honourable gentleman observed how extraordinary it was that arsenic should have an entirely different action on two different subjects. Two persons shall have taken the same quantity of arsenic. On the one it shall act just like an anodyne, soporifically; first producing somnolency, and finally ending in the sleep of death, without pain or struggle. In the other, after it has been taken into the stomach, it shall produce violent vomiting and extreme agony, which shall continue until death takes place in the midst of excruciating torture. In the first instance, after death, dissection will show no internal ulceration. In the second it will present marked appearances of the most violent inflammatory action. He was constantly struck with surprise at seeing, in cases where the precise causes of death were surely known, the *post mortem* appearances disagreeing *in toto* from what they ought to be, considering the cause of death. Medical men should bear these facts in mind when they are called upon to give forensic evidence.—*Atlas.*

DETECTION OF METALLIC ARSENIC FOR JUDICIAL PROCEEDINGS.

In order to show the separation of Arsenic from the contents of the stomach by different methods, Prof. Otto once directed that a grain of arsenious acid should be added to a mixture of egg and potatoes. This poisonous mass was boiled with a ley of potassa, and, after solution had ensued, acidulated with muriatic acid, as had been recommended, for the purpose of separating, so far as possible, organic matter, previous to the general diffusion of the admirable method of Mr. Marsh. The precipitate, however, produced by sulphuretted hydrogen in the filtered acid solution, did not contain any arsenic. The reason of this was soon discovered. By the action of potassa on the white of egg and similar proteine bodies, sulphuret of potassium, as is well known, was produced; this being decomposed by the acid, the metallic arsenic of the arsenious acid was disengaged by the sulphuretted hydrogen in the form of sulphuret of arsenic. This method is therefore inapplicable.—*Liebig's Annalen.*

SPRING WATER CONTAINING ARSENIC

SOME hot Springs have been discovered in Algiers, or *Algeria*, as the French love to call their valuable possession in Africa, at Ham-am-escoutin, which are said to contain a small quantity of Arsenic The water is at 80° Reau, (212° Fahr,) and deposits a large quantity of blueish white sediment which has not yet been analysed. —*Mechanics' Magazine*, No 975.

APPLICATION OF VOLTAIC PRECIPITATION TO THE DETECTION OF MINUTE PORTIONS OF ARSENIC.

IN a recent lecture to the Medico-Botanical Society, by Dr Sigmond, on mineral and vegetable poisons, the Professor exhibited a process lately Proposed by Captain Powell for the Detection of Minute Portions of Arsenic, by passing a current of electricity through the solution suspected of containing it The experiment showed that if to a liquid in which arsenic is suspected to be present potass is added, and then submitted to voltaic action, arsenic will be deposited on one side, on a plate of copper inserted to receive it, and the potass on the other Dr S observed that the idea was not altogether new, for Dr Paris, some years back, proposed a somewhat similar test for mercury, and Sir Humphry Davy had applied it to other metals Dr Sigmond then proceeded to show the superiority of this test over those used by Orfila in Madame Laffarge's case this depended upon the impossibility of there being those adulterations in the means employed which were more than suspected to exist on that occasion

ANTIMONY AS A POISON

MM FLANDIN and DANGER have submitted to the Academy of Sciences at Paris their experiments made to ascertain to what extent the existence of poison in the body can be ascertained with reference to medical jurisprudence They used for their analysis the apparatus of Marsh, but with all the modifications which recent circumstances have shown to be necessary, and have arrived at the conclusion that Antimonial, like arsenical stains, are, to a degree, fallacious Their experiments confirm, both as regards antimony and arsenic the assertion of other eminent chemists, that M Orfila was in error when he said that their existence can be ascertained in the bones of animals to which they have been given With reference to the use of antimony as a medicine, they stated that they had administered this substance in various doses to several dogs, and, upon dissection after death, and careful analysis with the apparatus of Marsh, they ascertained that it had not been absorbed into the system generally, but into particular organs, without regard to the hitherto received notions of vascularity Whatever was the quantity or the mode of injection of the poison, none was found in the lungs, and almost invariably the presence of the poison after death was indicated exclusively in the liver In the nervous and osseous system there were no traces of poison, and this also appears to be the case with arsenic —*Athenæum*, No 765

NEW ANTIDOTE TO CORROSIVE SUBLIMATE.

M. L. Mialhé has ascertained that the hydrated protosulphuret of iron, a perfectly inert body, possesses the valuable property of instantly decomposing Corrosive Sublimate, forming protochloride of iron and bisulphate of mercury, two substances perfectly harmless,—a property which has caused him to announce that the hydrated protosulphuret of iron is, *par excellence*, the antidote to this terrible poison.

When the most minute portion of corrosive sublimate is introduced into the mouth, an insupportable and characteristic metallic taste is instantly perceived; it is simply necessary to rinse the mouth for a few seconds with the sulphuret of iron, when the mercurial taste disappears, as if by enchantment.

To this, the editor of the *Annals of Chymistry* adds: "The hydrated protosulphuret of iron may be formed by adding to a solution of sulphate of iron (green vitriol), a solution of bihydrosulphuret of ammonia, until no further precipitate be formed; collecting the precipitate on a filter, and washing to free from excess of precipitant. It should be prepared as wanted, since, by exposure to the atmosphere, gradual decomposition ensues, with formation of peroxide of iron."

In a subsequent note, M. Mialhé is of opinion that the above antidote is not confined to mercurial salts alone, but that it will equally serve to counteract the injurious effects of the salts of lead and copper. In preparing it, (the formula being now first given by the author), M. Mialhé recommends the use of water that has been boiled, to prevent the oxidation of the precipitate, which he directs to be prepared with the bihydrosulphuret of soda, and to be preserved under distilled water, (also previously boiled,) in a vessel filled to the cork.—*Journal de Pharmacie*, October, 1842.

ACTION OF WATER ON LEAD.

In a second paper on this subject, in the *Transactions of the Royal Society of Edinburgh*, (vol. xv. part 2, p. 274), Prof. Christison states the following, as the results of his entire investigation:—

"From the facts now detailed, together with the results of my former inquiries, the following conclusions may be drawn as to the employment of lead pipes for conducting water:—

1. Lead pipes ought not to be used for the purpose, at least where the distance is considerable, without a careful examination of the water to be transmitted.

2. The risk of a dangerous impregnation of lead is greatest in the purest waters.

3. Water which tarnishes polished lead when left at rest upon it in a glass vessel for a few hours, cannot be safely transmitted through lead pipes without certain precautions. (Conversely, it is probable, though not yet proved, that, if polished lead remain untarnished, or nearly so, for twenty-four hours in a glass of water, the water may be safely conducted through lead pipes.)

4. Water which contains less than about an 8000th of salts in solution cannot be safely conducted in lead pipes, without certain precautions.

5 Even this proportion will prove insufficient to prevent corrosion, unless a considerable part of the saline matter consist of carbonates and sulphates, especially the former

6 So large a proportion as a 4000th, probably even a considerably larger portion, will be insufficient, if the salts in solution be in a great measure muriates

7. It is, I conceive, right to add, that in all cases, even though the composition of the water seems to bring it within the conditions of safety now stated, an attentive examination should be made of the water after it has been running for a few days through the pipes, for it is not improbable that other circumstances, besides those hitherto ascertained, may regulate the preventive influence of the neutral salts

8 When the water is judged of a kind which is likely to attack lead pipes, or when it actually flows through them impregnated with lead, a remedy may be found, either in leaving the pipes full of the water, and at rest for three or four months, or by substituting for the water a weak solution of phosphate of soda in the proportion of about a 25,000th part"

NEW TEST FOR COPPER

Verguin observed, by chance, that Copper may be disengaged, in the metallic state, from any solution containing it, by feebly acidulating the liquid with muriatic acid, and placing it in a capsule formed with platina foil over this must be arranged a piece of tin plate in such a manner as to touch both the liquid and platina A deposit of metallic copper on the surface of the platina ensues, which is firmly adherent, and maintains its metallic lustre The metals should be perfectly clean —*Ph C Bl, M Verguin Annals of Chymistry*, No 9.

INJURIOUS DYE FOR THE HAIR

Dr A Th Bruck, of Osnabruck, thinks that a violent ophthalmia, under which a lady of forty was labouring, might be attributed to a Dye which she had used during several years for her Hair It is sold at Cologne under the name of *Poudre d Italie* and has been shown, by chemical analysis, to consist of lead and lime —*Schmidt's Jahrb*

ANALYSIS OF SOUTH-SEA GUANO

Mr Fownes having examined two specimens of South Sea Guano, imported for agricultural use, observes —"It is difficult to imagine a manure better fitted for almost universal use than this 'guano' it contains, in a highly concentrated form, every thing that plants require for their sustenance, with the exception, perhaps, of potash, which, however, is often abundantly supplied by a soil poor in other respects.

"The presence of a large quantity of oxalate of ammonia is a curious fact there can be no doubt that this substance owes its existence, in some way or other, to the uric acid contained in the excrement of the sea-birds, to the decomposition of which the guano deposits are due. We can easily imagine that, in this mass of putrefying substance, kept in a moistened state by the dews of night, a decomposition of a peculiar kind may be set up in the uric acid, and its gradual conversion effected into new products, among which may easily be oxalate of ammonia."

NEW PATENT MANURE.

ON March 7, Prof Daubeny exhibited to the Ashmolean Society, a specimen of Mr Daniel's New Patent Manure, which is stated by the inventor to consist of carbonate of ammonia, sawdust, and bituminous matter As the materials from which this new kind of fertilizer is drawn appear to consist of inorganic matter exclusively, Dr. Daubeny instanced its discovery as one of the means which nature has placed within our reach for increasing the amount of vegetable produce proportionately to the increase of mankind, and so maintaining the necessary ratio between subsistence and an increasing population In a purely pastoral or agricultural community, the manure of animals might suffice, but in a higher advanced and more populous condition of society, it becomes requisite to seek for new materials to supply the loss which the soil of the country sustains Thus, bone-dust is procured from South America in such quantities, that it is computed, on the calculation that each head of cattle supplies bony matter equal to 84lb in weight, that not less than 1,200,000 oxen are slaughtered annually in that country for the supply of bone manure to England alone Guano, or the dung of sea birds, is likewise extensively imported for manure, but as both these sources will fail in proportion as the several countries become more peopled, it is fortunate that we may find substitutes for these in inorganic substances Such is the nitrate of soda, so much used of late, such is the New Manure, patented by Mr Daniel

Dr Buckland, in commenting upon the above discovery, considered that an important principle, respecting stimulating manures had been brought forward, viz, that a plant, under their action, draws more freely from the atmosphere In addition to the increase of human manure with the population, the quantity of carbon given out by animals, and left to be absorbed by plants, is proportionately increased, and it may be confidently predicted, that by the discovery of such agents, agriculture will be enabled to keep pace with the increase of population, if the latter be not stimulated by unwise regulations, and that as animal life increases in a direct ratio to the amount of subsistence, so the nutritious effects of animal manure, by giving greater energy and vigour to the organs of plants, will cause them to draw more abundantly from the atmosphere, and thereby force a proportionately large quantity of them into existence

AGRICULTURAL CHEMISTRY

PROF DAUBENY has read to the British Association, a very important paper, "On the Agricultural importance of ascertaining the minute portions of matter derived from organic sources, that may be preserved in the strata, and on the chemical means by which its presence may be detected." In the *Literary Gazette*, No. 1330, is given "the only correct abstract" of this valuable contribution to Agricultural Chemistry; whence we have but space to quote the opening column:—"The researches of Sprengel and Liebig, by showing the manner in which minute quantities of certain ingredients may impart to the soil into which they enter as constituents, entirely new properties with reference to the purposes of agriculture, have communicated additional interest to those methods of analysis which aim at determining the chemical composition of the superficies, and of the substratum from which the former chiefly derives its principal ingredients. The rude mechanical method adopted, even by such chemists as Sir H. Davy, is no longer considered sufficient. The nature, as well as the amount of the organic matter present, and the existence of phosphates, &c. in the proportion of $\frac{1}{1000}$, or even $\frac{1}{10000}$ part of the entire mass, are points deserving investigation, affording a clue to the description of manures most likely to be useful, and to the general treatment which the land may require. A few simple and easy calculations may show how very small a proportion of this ingredient might suffice, during a long period of time, for the demands even of those crops which require the largest amount of it for their nutrition. Suppose the subsoil of a single acre of ground, turned up to the depth of a foot, to weigh 1000 tons: now, if this rock should be found to contain only $\frac{1}{1000}$th part of phosphate of lime, it will follow that no less than a ton of this substance might be extracted from the uppermost foot of the subjacent rock by the action of the elements, or by chemical means. Now, one ton of phosphate of lime would be adequate to supply 125 tons of wheat, or 680 tons of turnips. And, if we reckon the average loss obtained from an acre of land to be, of wheat 1 ton, and of turnips 15, it is evident that we have at hand as much phosphate of lime as would be necessary for 125 crops of the former, or for 45 crops of the latter."

PAINTING IN FRESCO.

The Report of the Commissioners on the Fine Arts on the proposed decoration of the New Houses of Parliament with Paintings in Fresco, involves several interesting points of chemical inquiry; especially as regards the fittest condition of lime for fresco-painting, its action on colours, and its setting. Dr. Reid has appended to the Report some remarks on these subjects, as well as on the probable effects of gas on fresco-paintings, which Dr. Reid considers will not be injurious. A well-informed Correspondent of the *Times*, (Oct. 31,) however, objects to the above Report,*—that Dr. Reid does not state what are "the proper substances" from which carburetted hydrogen gas can be prepared upon a large scale, which shall contain neither sulphur nor ammonia. But, certain it is, that such substances have not yet been generally known; nor is there any substance which has hitherto been employed for this purpose except bituminous coal, which always contains sulphur, and always produces ammonia in its distillation. Nor, are there any subsequent operations practicable on a large scale which will entirely remove these impurities; for, although numberless patents have been obtained for this purpose, they only effect comparative purification, and certainly do not produce that 'entire exclusion' which Dr. Reid imagines.

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* This Report having been reprinted in the newspapers, and at a cheap rate, we do not quote the details of Dr. Reid's opinion.

"There is another cause of impurity of the atmosphere, which Dr. Reid has entirely overlooked in his list of contaminations, and which is of far more importance than many of the fanciful objections which he has brought forward. I allude to the sulphuric and sulphurous acid which the atmosphere of the metropolis contains, arising from the immense combustion of coal that takes place. The presence of these gases is perfectly well known to scientific men; and none of Dr. Reid's schemes for straining, washing, and purifying the air, are likely to eliminate this important contamination from the air admitted into the new Houses of Parliament. The effect which these gases are likely to produce on the fresco paintings are far more important than any, or all, of the numerous causes of impurity to which Dr. Reid has alluded. The rapid destruction of metals in London is a well-known effect of these contaminations, and the omission of all mention of this important particular in Dr. Reid's Report is certainly not a little extraordinary; as it cannot fail to have a considerable effect on the subject under consideration, if its real nature be understood, and its importance duly appreciated."

THE DAGUERREOTYPE.

THE following are the most important improvements made during the past year in this process:—

Prints produced without Engraving.—Mr. M. E. Brazendale, of Newcastle, has communicated to the *Mechanics' Magazine*, No. 973, the annexed method of producing excellent Daguerreotype Prints, without the aid of an Engraver. A Daguerreotype is first etched by the voltaic process invented by Mr. Grove,* when an impression is taken therefrom, on "transfer paper," using the kind of composition ink generally employed for transferring operations.† This impression is transferred to a lithographic stone, the surface of which is finely *grained* by rubbing it with sand, and a muller. The stone is then prepared with acid, &c., and printed impressions taken as usual. The pictures are *positive*, that is, they have their lights, shades, &c., precisely as in nature. Probably, laying an *aquatint ground* on the Daguerreotype plate, previous to its undergoing the electro-etching process, would greatly improve the copper plate impressions; as, by giving an uneven, instead of a flat surface, the ink will necessarily *hold* better. The etching ground may, if thought fit, be taken off after the plate is slightly corroded, and afterwards finished without it.

Tinting Plates.—M. Bisson, by a galvanic process, covers the plate with a slight coating of silver, much more even and perfect than the surface of the ordinary silvered plate, and the object is consequently represented with greater fidelity and boldness. Another improvement of M. Bisson's is, in giving, by the action of the galvanic pile, a slight gold tint to the drawing, which takes away its unpleasant looking-glass appearance, and causes the objects to stand forth almost as clearly and vigorously as in drawings produced by hand.

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* Vide Proceedings of the London Electrical Society, vol. i. 1841, p. 94.

† That containing the smallest quantity of lampblack ought to be chosen.

Instantaneous Proofs.—M. Arago has exhibited to the Academy of Sciences, at Paris, some Daguerreotype proofs, obtained by M. Bisson, jun., by means of bromine, associated with chlorine, without using the iodine box. Each of these proofs was obtained in a very short time, (half a second,) which allowed very fugitive subjects to be represented — for instance, the smile of an infant, a funeral train, a number of men and horses traversing the Pont Neuf. Among those exhibited, some were remarkable for their size, and others for their picturesque beauty.—*Comptes Rendus*, t. xv. p. 345.

Experiment by Galvanic Light.—In *Silliman's Journal*, we find detailed "A Daguerreotype Experiment by Galvanic Light. By B. Silliman, jun., A.M.; and W. H. Goode, M.D.;" which experiments, however, were not published at the time they were made. The authors state that in November, 1840, they succeeded in obtaining a photographic impression, by galvanic light reflected from the surface of a medallion to the iodized surface of a Daguerreotype plate. The large battery in the laboratory of Yale College, consisting of nine hundred pairs of plates, ten inches by four, was charged with a weak solution of sulphuric acid, and its poles adjusted with charcoal points, in the manner which is customary when an intense light is to be produced by means of this instrument. Two pictures were obtained; one of which is made up of a blur, or spot, produced by the light from the charcoal points, the image of the retort-stand, on which a medallion of white plaster rested, and the image of the medallion, but the lines on its surface are not given. The camera was about six feet from the charcoal points, when this impression was taken; and the medallion a little on one side, and in the rear of the points. The plate was exposed to the light about twenty seconds, and no means were employed either for condensing the light on the objects to be copied, or that reflected from them, on the lens which gave the image. The only lens employed was a French achromatic, three inches in diameter, and of about sixteen inches focal length. Another picture was taken of the medallion only, which was placed about two feet from the charcoal points, and the camera about four feet from it, and in such a position that the charcoal points did not come within the field of the lens. This picture has been inadvertently destroyed. The plates used were of inferior quality, being some of the first of American manufacture.

Portraits.—M. Claudet has patented certain improvements in his process, (see *Year-book of Facts*, 1842, p. 178.) By these, the operator is enabled to work on either large or small plates, and obtain images of near or distant objects: the light and mercury are made to act simultaneously on the plate, and thus increase the intensity of the image: painted back-grounds are transferred to the plate as well as the likeness of the sitter; gas-light is employed in the absence of day-light; and the whole process is performed in a lighted room, instead of in the dark, as heretofore.

Self-transmitting Surfaces.—In a paper lately read to the Academy of Sciences, at Paris, on some remarkable circumstances connected with the Daguerreotype, it was stated that a cameo having been suspended so as to hang near, but not to touch, a polished plate in a box from which all light was excluded, the engraving of the cameo was clearly and distinctly marked on the plate. M. Breguet, the celebrated watchmaker, has addressed a letter to the Academy, in which he states that he has frequently seen, on the polished inner surface of the gold cases of his flat watches, the name of his house plainly and legibly marked; the impression having been received from the engraved letters of the covering of the works, which did not touch the case.

PHOTOGRAPHY.

Chrysotype is a name given by Sir John Herschel to one of two new Photographic effects discovered by him, and thus detailed in the *Athenæum*, No. 773:—"The preparation of the chrysotype paper is as follows:—Dissolve 100 grains of crystallized ammonio citrate of iron in 900 grains of water, and wash over with a soft brush, with this solution, any thin, smooth, even textured paper. Dry it, and it is ready for use. On this paper, a photographic image is very readily impressed; but it is extremely faint, and in many cases quite invisible. To bring out the dormant picture, it must be washed over with a solution of gold in nitro-muriatic acid, exactly neutralized with soda, and so dilute as not to be darker in colour than sherry wine. Immediately the picture appears, but not at first of its full intensity, which requires about a minute, or a minute and a half to attain, though, indeed, it continues slowly to darken, for a much longer time, but with a loss of distinctness. When satisfied with the effect, it must be rinsed well two or three times in water, (renewing the water,) and dried. In this state, it is half fixed. To fix it completely, pass over it a weak solution of hydriodate of potash, let it rest a minute or two, (especially if the lights be much discoloured by this wash,) then throw it into pure water till all such discolouration is removed. Dry it, and it is thenceforward unchangeable in the strongest lights, and (apparently) by all other agents which do not destroy the paper."

"The other process is as follows:—Mix together equal parts of the solution of the above-named salt, and of a saturated solution of the common yellow ferrocyanate, or, as it is called, prussiate, of potash. The result is a very black ink, which, washed over paper, gives it a deep violet-purple colour, and is remarkably sensitive to light—whitening rapidly, and giving positive pictures—the only defect of which, (and it is a fatal one for use,) is their want of durability, as they fade with darkness in a few hours. And, what is very singular, *the same paper* is again and again susceptible of receiving another and another picture, which die away in like manner, without any possibility, so far as yet discovered, of arresting them."

Plates.—M. Nothomb has advantageously substituted proto-chloride of mercury, (calomel,) for running mercury, (quicksilver,) as proposed by Daguerre.

The following is the substance of a communication made by Prof. Barnard to Prof. Silliman. "Let the plate be prepared in every respect as if an impression were to be taken according to the method of M. Daguerre. Let it be then exposed for the space of half a minute to the action of chlorine gas, diluted with common air to such a degree that it may be inhaled without any particularly unpleasant sensation. It will then be found so extremely sensitive, that on being placed in a camera, with an aperture such as is commonly employed in taking miniature portraits, an impression will be produced upon it in the smallest time in which it is possible to remove and replace the screen. The completion of the picture over mercury is effected in the usual way. A plate thus chlorized, on exposure to light almost immediately assumes a very deep violet colour, nearly approaching black. The mercury is not directly tarnished, and in this state the picture is even more beautiful than after being washed with the hyposulphate of soda. But without this washing it cannot be preserved." The lights produced by this process are much finer and smoother than those of the original process, and the quickness of the camera operation is such, that a man walking may be represented with his foot lifted as about to take a step. "The quantity of chlorine necessary to produce the effect is exceedingly minute. In our early experiments, we employed a quart bottle of the gas, opening it in a deep box, and leaving out the stopper while deliberately counting twenty. Replacing then the stopper, the plate was laid for half a minute over an opening in the top. After fifty experiments, the gas in the bottle seemed not to have lost any of its original intensity of colour. Much care is necessary to avoid an excess of chlorine. The principal cause of our early failures arose from an error of this kind. One may easily determine, with any apparatus, the time and quantity necessary, by laying a plate over the aperture and drawing it partially off at intervals. The action of the gas will then be greatest, of course, upon the part longest exposed. Too much care cannot be taken to exclude the light during the process of preparation."

"*Observations on Photographic Processes*" is the title of a paper of valuable facts in manipulation, &c., communicated by William F. Channing, to *Silliman's Journal*, and quoted in the *Annals of Chymistry*, No. 5. The author well observes, that "there is no science which is now advancing so rapidly as Photography," and we regret that we can only direct attention to the processes detailed by him, which amply attest the accuracy of his assertion.

THERMOGRAPHY

Is the name of a new process, more important than any of its kind yet discovered, and detailed in the following interesting paper, read to the Cornwall Polytechnic Society, on November 8, of which excellent Society Mr. Hunt is the Secretary.

Art of Copying Engravings, or any Printed Characters from Paper on Metal Plates, and on the Recent Discovery of Moser, relative to the Formation of Images in the Dark, by Mr. Robert Hunt.

The Journal of the Academy of Sciences, at Paris, for the 18th of July, 1842, contains a communication made by M. Regnault, from M. Moser, of Konigsberg, "Sur la formation des images Daguerriennes," in which he announces the fact, that "*when two bodies are sufficiently near they impress their images upon each other.*" The Journal of the 29th of August contains a second communication from M. Moser, in which the results of his researches are summed up in twenty-six paragraphs. From these I select the following, which alone are to be considered on the present occasion.—"All bodies radiate light even in complete darkness —This light does not appear to be allied to phosphorescence, for there is no difference perceived whether the bodies have been long in the dark, or whether they have been just exposed to daylight, or even to direct solar light.—Two bodies constantly impress their images on each other, even in complete darkness. However, for the image to be appreciable, it is necessary, because of the divergence of the rays, that the distance of the bodies should not be very considerable. To render the image visible, the vapour of water, mercury, iodine, &c., may be used.—There exists *latent light*, as well as latent heat."

The announcement at the last meeting of the British Association, of these discoveries, naturally excited a more than ordinary degree of interest. A discovery of this kind, changing, as it does, the features, not only of the theories of light adopted by philosophers, but also the commonly received opinions of mankind, was more calculated to awaken attention than anything which has been brought before the public since the publication of Daguerre's beautiful Protographic process. Having instituted a series of experiments, the results of which appear to prove that these phenomena are not produced by *latent light*, I am desirous of recording them.

I would not be understood as denying the absorption of light by bodies, of this I think we have abundant proof, and it is a matter well deserving attention. If we pluck a Nasturtium when the sun is shining brightly on the flower, and carry it into a dark room, we shall still be enabled to see it by the light which it emits. The human hand will sometimes exhibit the same phenomenon, and many other instances might be adduced in proof of the absorption of light; and I believe, indeed, of the principle that light is latent in bodies. I have only to show that the conclusions of M. Moser have been formed somewhat hastily, being led, no doubt, by the striking similarity which exists between the effects produced on the Daguerreotype plates under the influence of light, and by the juxtaposition of bodies in the dark, to consider them as the work of the same element.—(For the Experiments, see the *Athenæum*, No. 786)

The following is the process at present adopted by me, which I consider far from perfect, but which affords us very delicate images. A well-polished plate of copper is rubbed over with the nitrate of mercury, and then well washed to remove any nitrate of copper which may be formed; when quite dry, a little mercury taken up on soft leather or linen is well rubbed over it, and the surface worked to a perfect mirror. The sheet to be copied is placed smoothly over the mercurial surface, and a sheet or two of soft clean paper being placed upon it, is pressed into equal contact with the metal by a piece of glass, or flat board; in this state it is allowed to remain for an hour or two. The time may be considerably shortened by applying a very gentle heat for a few minutes to the under surface of the plate. The heat must on no account be so great as to volatilize the mercury. The next process is to place the plate of metal in a closed box, prepared for generating the vapour of mercury. The vapour is to be slowly evolved, and in a few seconds the picture will begin to appear; the vapour of mercury attacks those parts which correspond to the white parts of the printed page or engraving, and gives a very faithful, but somewhat indistinct image. The plate is now to be removed from the mercurial box, and placed in one containing iodine, to the vapour of which it is exposed for a short time; it will soon be very evident that the iodine vapour attacks those parts which are free from mercurial vapour, blackening them. Hence there results a perfectly black picture, contrasted with the grey ground formed by the mercurial vapour. The picture being formed by the vapours of mercury and iodine, is, of course, in the same state as a Daguerreotype picture, and is readily destroyed by rubbing. From the depth to which I find the impression made into the metal, I confidently hope to be enabled to give to these singular and beautiful productions a considerable degree of permanence, so that they may be used by engravers for working on. It is a curious fact, that the vapours of mercury and of iodine attack the plate differently; and I believe it will be found that vapours have some distinct relation to the chemical or thermo-electrical state of the bodies upon which they are received. Moser has observed this, and attributes the phenomena to the colours of the rays, which he supposes to become latent in the vapour on its passing from the solid into the more subtile form. I do not, however, think this explanation will agree with the results of experiments. I feel convinced that we have to deal with some thermic influence, and that it will eventually be found that some purely calorific excitement produces a molecular change; or that a thermo-electric action is induced, which effects some change in the polarities of the ultimate atoms of the solid.

These are matters which can only be decided by a series of well-conducted experiments. Although attention was called to the singular manner in which vapours disposed themselves on plates of glass and copper, two years since, by Dr. Draper, Professor of Chemistry at New York; and about the same time to the calorific powers of the solar spectrum, by Sir John Herschel; and to the influence of heat artificially applied, by myself; yet it is certainly due to M. Moser, of Konigsberg, to acknowledge him to be the first who has forcibly called the attention of the scientific world to an inquiry which promises to be as important in its results as the discovery of the electric pile, by Volta.—*Quoted in the Athenæum*, No. 786.

Natural History.

ZOOLOGY.

REES AND LANE ON THE STRUCTURE OF THE BLOOD CORPUSCLES

THE chief points are, that the Blood Corpuscle contains a fluid, and that the corpuscle of mammals, as well as the other lower vertebrata, contains a nucleus The human blood being $\frac{1}{3250}$th of an inch in diameter, its nucleus is described as a thin circular layer of colourless substance measuring from $\frac{1}{4800}$th to $\frac{1}{5000}$th of an inch

With regard to the fluid, if we remember rightly, M. Mandl, *(Anatomie Microscopique,)* expressly states his conviction, that the appearance of the corpuscles when removed from the body is due to coagulation, as he considers the corpuscles are in fact not solid while circulating in the living body As to the nucleus, it appears to us that Messrs Rees and Lane have described under this appellation the blood corpuscle deprived of its colouring matter, and which has been long well known,—an old thing with a new name Thus, Sir E Home, *(Phil Trans* 1818, p 198, plate 8,) has figured sixteen globules in their colouring matter, occupying the same space as twenty-five of the same globules with the colouring matter removed Schultz has described the same central part of the blood corpuscle, which he procured by washing blood with water, and then adding iodine and Gulliver saw them in abundance in the sediment of washed blood "The human blood corpuscles, enlarged at first by water, and then deprived of colouring matter and reduced in size, generally present a diameter of $\frac{1}{4870}$th of an inch, whether detected in the pure water, or rendered more apparent by corrosive sublimate They have a very characteristic appearance, being remarkably flat and pellucid It is obvious, from the size, shape, and general appearance of these particles, that they are not identical with those generally described as the nuclei of the blood corpuscles The average diameter of the discs in the first instance was $\frac{1}{3428}$th of an inch" *(Lon and Edin Phil Mag* for Feb 1810) It does not appear to us to follow as a matter of course, that this basis of the mammiferous corpuscle is identical with the nucleus of the corpuscles of the oviparous vertebrata on the contrary, we cannot help considering that there is an essential difference in this respect between the corpuscles of mammalia and the corpuscles of the lower vertebrata —*Vide Guy's Hospital Reports*, No 13, Oct 1841 —*Lon and Edin Month Jour Med Science*, Dec 1811 p 906

CAPILLARY VESSELS.

THE most delicate vessels discoverable in the human body are finer than the diameter of a *blood-globule*, and measure from $\frac{1}{600}$ to $\frac{1}{367}$ of a line Weber found the diameter of the smallest vessels in dry preparations, from $\frac{1}{300}$ to $\frac{1}{500}$th Krause states the finest vessels of the *choroid* to measure $\frac{1}{301}$; of the *retina* $\frac{1}{340}$; of the muscular coat of the small intestines $\frac{1}{740}$, of the *tibialis muscle* $\frac{1}{1110}$ parts of a line. The above accord generally with the measurements given by Valentin and Berres.—*Wagner, uber Ernahrung und Absonderung*

STRUCTURE OF THE LUNGS.

In a paper read to the Academy of Sciences, at Paris, M Bourgery is of opinion that man and, in general, the mammalia, at the two extremities of their lives, approach the two classes of vertebrated animals which display the two extremes of aerial respiration In fact, says the author, as adolescence approaches, the Lungs, from year to year, present fresh sanguineous surfaces to the air, so that the breathing, by its development, if not by the form of its organs, more and more resembles the respiration of birds In the old man, in proportion to the advance of decrepitude, the lungs are gradually decomposed into aerial caverns, which diminish the sanguineous surfaces in proportion, so that his respiration, both by its actual volume, and by the alterations of the structure of the organ in which it takes place, resembles that of reptiles

EYES OF ANIMALS.

Dr Feldmann, of Munich, from a series of experiments on the Eyes of Animals which he has performed in concert with Dr Davis, also of Munich, states as the result —1st, that a cornea detached from the eye of an animal, and re joined by sutures, again becomes a perfect substance by new adhesions, 2nd, the same effect is produced with the cornea detached from the eye of an animal, by transplanting it to the eye of another animal, even of another species

NEW MECHANISM OF THE HUMAN EYE

Mr J M Ferrall has drawn the attention of the Royal Irish Academy to a new and beautiful Mechanism belonging to the Human Eye, consisting of a distinct fibrous tunic, investing the globe of the eye, facilitating its movements, and separating it from all the surrounding tissues

The anatomy of the schools, and of the best authors, teaches that the ball of the eye is in contact with its muscles, and, between them, with a quantity of adipose substance, on which it was supposed to be cushioned It was difficult to conceive, however, why the eye did not manifest any of the symptoms incidental to pressure suddenly endured whenever those muscles were brought into action, since there appeared to be no provision for its protection That pressure, suddenly made on the globe of the eye, produces the sensation of a spark or flash of light, is familiarly known as a consequence of a slight blow on the eye

The act of sneezing is frequently followed by a similar phenomenon, and Sir Charles Bell has shown, in the *Philosophical Transactions*, that it is occasioned by the sudden pressure on the ball of the eye, by the orbicularis palpebrarum, or principal muscle of the eyelids, which is suddenly brought into action by the respiratory nerves. The four recti muscles, which move the eye in different directions, being favourably placed, (according to the received anatomy,) for exercising such a pressure, it might have been expected that a similar phenomenon would have resulted; but no such coruscations have ever been observed to follow their most rapid actions.

The discovery of this tunic which Mr. Ferrall has ventured to name the *Tunica Vaginalis Oculi* at once explains the absence of those phenomena, by showing that a protective provision has always existed to prevent them.

But, the most beautiful portion of this mechanism lies in the anterior portion of this tunic, where are to be found six different well-defined openings, through which the tendons of the muscles pass to their insertion in the sclerotic coat of the eye, and over which they play, as over pulleys, in their progress.

STRUCTURE OF WARTS.

THE common Warts met with on the integuments of the hand, consist of papillose elongations of the corium, which appear as delicate, closely packed fibres, covered by the upper skin. Warts with peduncles contain soft cellular tissue, and often fat. Both kinds are to be met with in the domesticated mammalia.—*Valentin's Repertorium.*

MICROSCOPIC EXAMINATION OF THE MILK OF WET NURSES.

ALTHOUGH M. Donné has gained much insight into the structure of the milk globule, it has remained for M. Devergie to explain further the pathological and nutritious character of the various sized globules so frequently seen and described. In his very interesting paper inserted in the *Bulletin de l'Académie Royale de Médecine de Paris*, 30 November, 1841, p. 201, he arrives, after considerable experience, at the following conclusions:—1. That the globules are generally of greater dimensions in the richest than in the poorest kinds of milk. 2. That the globules augment in volume, from the period of confinement until a certain period of lactation; for example, there are more globules of the $\frac{1}{100}$th of a millimetre at three months, than in the same milk at fifteen days. Again, M. Devergie has placed beyond all doubt the essential nutritive qualities of milk with large globules, and that by continual observations made on nurses and children; that is to say, by comparing the bulk and strength of children with the microscopic qualities afforded by the milk of the nurse, and also by comparing the milk, and general state of strength and health of the nurse.

The Report made to the Academy, as given in the work above cited, is well deserving the attention of medical men and others, engaged in the selection of wet-nurses, as there are arguments certainly in favour of the use of the microscope in this important branch of inquiry: thus, supposing two children are born, the one feeble and delicate, the other subject to gastro-intestinal irritation, by the assistance of the microscope it would be easy to select a milk of greater strength for the former, and one of a weaker character for the latter.

Both Devergie and Donné agree, that the milk-globules average from the $\frac{1}{300}$th to the $\frac{1}{100}$th of a millemetre in diameter; that there exist even some larger, and others smaller. Ordinary nurses have for the most part milk-globules which average between the two extremes of measurement; their average in the cases observed by M. Devergie appears to be 61 in 100. Nurses with small globules have been found in the proportion of 22 in 100; their milk was in general poor, and incapable of acquiring richness on the return of lactation.

M. Devergie does not, however, in any case, conclude that the health of children is in direct relation with the size and numbers of these globules; but that nutrition is not affected in relation to the strength of the milk, but according to the powers of *assimilation* possessed by the infant. The whole paper well deserves attentive perusal. —*Microscopic Journal*, No. 13.

HYPNOLOGY.

Dr. Binns, in his new work, entitled *The Anatomy of Sleep*, recommends the following means of procuring Rest. Let the person turn on his left side, place his head comfortably on the pillow, so that it exactly occupies the angle a line drawn from the head to the shoulder would form; and then, slightly closing his lips, let him take rather a full respiration, breathing as much as he possibly can through the nostrils. This, however, is not absolutely necessary; as some persons breathe always through their nostrils during sleep, and rest as sound as those who do not. Having taken a full inspiration, the lungs are then to be left to their own action; that is, the respiration is neither to be accelerated nor retarded. The attention must now be fixed upon the action in which the patient is engaged. He must depict to himself that he sees the breath passing from his nostrils in a continuous stream; and the very instant that he brings his mind to conceive this apart from all other ideas, consciousness and memory depart; imagination slumbers, fancy becomes dormant, thought subdued: the sentient faculties lose their susceptibility, the vital or ganglionic system assumes the sovereignty, and, as we before remarked, he no longer wakes, but sleeps. This train of phenomena is but the effect of a moment. The instant the mind is brought to the contemplation of a single sensation, that instant the sensorium abdicates the throne, and the hypnotic faculty steeps it in oblivion.

BALANCE OF PRESERVATION AND DESTRUCTION IN THE ANIMAL KINGDOM.

On Feb. 26, was read to the Ashmolean Society, a paper on this inquiry, by the Secretary, Mr. Bigge. He commenced with a brief review of the proportionate amount of animal life in the various zoological zones of the earth, showing how the balance of numbers is constantly maintained by ever-varying means. He then gave instances of partial derangements in the relative numbers of animals caused by man, with the re-adjustment of the balance by the operations of nature; and pointed out the frequent occasions, where a spirit of indiscriminate destruction has led to the extermination of animals, whose beneficial uses were not justly appreciated. Thus, Mr. Yarrell, in his *History of British Birds*, mentions the remarkable fact, that on some large farms in Devonshire, when the rooks had been destroyed from their supposed hostility to the young crops, the caterpillars, and other insects that feed on vegetable substances, increased to such an extent, and ruined the crops so utterly for three successive years, that the farmers were obliged to import rooks in order to restore their farms. He then alluded to the circumstance, that insects which are hurtful in their larva state, are frequently beneficial in some stage or other of their transformation, and that the good in general overbalances the mischief caused by them.

An extraordinary increase in the number of any variety of animal is generally accompanied with a corresponding increase of the animal whose province is to check its numbers: thus, in 1814 and 1815, the swarms of field mice in the Forest of Dean, which threatened at one time to destroy all the young trees, were followed by swarms of hawks, owls, weazels, and magpies, and ultimately the mice turned upon and destroyed each other. Sometimes, however, the means of re-adjusting the balances are not within reach. Thus, in the island of Mauritius, the introduction of rats from the ships of the early Dutch settlers almost led to the abandonment of the colony; as, from the distance of the island from the mainland, no influx of the natural enemies of the rat could take place. In 1826, the governor of the island offered a reward for rats' tails, and about 800,000 tails have been annually brought in; fire, as well as other means of destroying them, have also been adopted, but no artificial checks appear to be so efficacious as those provided by nature. There is no instance of the extermination of a single species of animal, excepting the Dodo. Mr. Bigge concluded the paper with pointing out, that amidst the great variations in the relative numbers of animals, the general result is, the preservation of each species in sufficient force; that wherever the balance is disturbed, adequate means are provided by nature to re-adjust it; and that it is our duty, as well as our interest, to study carefully the habits of animals supposed to be noxious, lest in our indiscriminate zeal to suppress them, we should abuse our power over the inferior races, and inadvertently disturb the general harmony of the animal system.

Dr. Buckland then called the attention of the Society to the utility of the Parasitic insect, which had not been alluded to by Mr. Bigge; the absence of which he described as being detrimental to the creatures to which they attach themselves. It is probable that each species of the larger animals has its peculiar parasite, which has its peculiar functions to discharge in connexion with the larger animal; and which, if transferred to an animal of a different class, invariably dies.—*Athenæum*, No. 750.

ZOOLOGICAL NOMENCLATURE.

Mr. Strickland has read to the British Association, the "Report of the Committee on Zoological Nomenclature." It noticed the great confusion arising out of the existing nomenclatures of France, Prussia, and Germany, the authors of each being ignorant of the names given by the others. Genus was often designated by three or four names; and no rule was observed. In other sciences it was not so; for of late years, chemists, astronomers, mineralogists, &c. had devoted themselves to fixing their respective languages, and it was full time that zoologists should do the same. In conclusion, he proposed a Greek or Latin characteristic word, the best being such as expressed some distinguishing character. Geographical names could hardly be used for genera; and for species only, when they were certainly confined to the country. Barbarous names well latinised in their terminations were admissible; and technical names applying to the habits of the animals were not objectionable. Mythological and historical names give rise to pleasing associations—such as Progne for the swallow, Clotho for the spider, Hydra for the polypus, Athene for the owl; but comparative names were often erroneous. Specific names from eminent persons might be employed in moderation; but inferior ones were to be avoided; also long harsh names above five syllables. Hybrid names, Greek and English, or Greek and French, and nonsense names, and anagrams, were also improper, though Mr. S. did not entirely condemn them. The names of families should end in *idæ*, and of sub-families in *inæ*. Specific names of species should begin with a small initial; and, in fine, an ample public expression should indicate the new genera and species arranged and named according to this Report.—*Literary Gazette*, No. 1332.

ZOOLOGY OF NEW ZEALAND

A REPORT has been read to the British Association, "On the present state of the Ichthyology of New Zealand," by John Richardson, M.D. The desirableness of a report on the Zoology of this country is very great, on account of its being so rapidly populated; and there can be but little doubt that many of the present animal inhabitants will disappear entirely, and others will be driven from their native localities. Of the mammalia, only the dog and rat have been seen; and no snakes. This report is confined to the fishes. Very little has been added to what was made known by those who accompanied Captain Cook in his first and second voyages. They figured or described upwards of sixty-three species, to which nine have been added by Cuvier and Valenciennes, and five by other writers, making in all seventy-seven. Some of these exhibit strange forms and habits. Many are strictly *littoral* progeny of the minute crustacea which deposit their spawn in such localities. The *Boleophthalmi* even ascend the beach, like little lizards, to pursue their prey. The *Plectognathi* are adapted for living in rough seas; their powers of swimming are small; some are protected with hard spines, like a hedgehog or sea urchin, and have a power of distending their skins with air or with water, according to circumstances. Marsupial animals characterize the animal kingdom of New Holland, and the same influence seems to have acted on fish to produce a character amongst them as remarkable as the kangaroo amongst mammalia As their organisation seems to fit them for districts with little water, so does that of these fishes. During the season that the water dries up, various species of *Batrachi*, *Gobiodes*, *Cyprini*, and *Apodes*, bury themselves in the mud, and like the Lepidosiren of the Gambia, remain in an inert state till the rain falls The sources from whence the information in this Report was obtained, are chiefly the manuscripts of Solander, with the drawings of Forster and Parkinson, now in the British Museum

THE ZOOLOGICAL SOCIETY.

At the Annual Meeting, held on April 29, the number of Fellows was stated at 2727, being a decrease of 122 within the previous year The Report of the Council refers to the death of Sir Francis Chantrey, and "the ready zeal with which he devoted his great taste and extensive practical knowledge to the interests of the Society, and the embellishment of the Gardens" The Council next refer to the death of Professor Ardouin, of Paris, (a Foreign Member,) "one of the most distinguished entomologists of modern times," as displayed in his various memoirs on the *Cantharides*, the *Pyrale de la vigne*, which for some years ravaged the rich vineyards of Burgundy, the *Termites*, which, originally imported from India, were destroying the wooden buildings of Rochelle, &c Among the deaths of Corresponding Members, are those of Dr Hancock, of Guiana, and M. Julien Desjardins

The income of the Society, during 1841, amounted to £11,611 15s 11d, and the expenditure to £10,931 17s 5d, being, in both, a considerable falling off as compared with the previous year, but savings to the amount of £907 2s 1d have been effected during the past year

The Society have, at length, resolved to erect a building for the Museum in the Gardens, and it was stated that the establishment would be removed thither before the next anniversary Among the donations to the Museum are five Orangs in Spirit, from Borneo, and a very valuable Collection of Skulls and Skeletons of the same animal, presented by James Brooke, Esq, of Borneo.

A Committee has been appointed for laying out a tract of ground added to the Gardens, and for the arrangement of the Gardens generally, with special reference to better accommodation for the Ruminantia, Carnivora, and Gallinacea In no previous year have the donations to the Menagerie been so numerous as in the past Unfortunately, however, the five Orangs presented by Mr Brooke, died during their passage from Borneo to England Many rare and valuable animals have been added by purchase among them are a very fine Lion, a Chati Ocelot, *(F Chati*, F. Cuv), the finest ever possessed by the Society, a large male Kangaroo, *(M. major)*, and three Chimpanzees, these last, unfortunately, died shortly after their removal to the Gardens The female Giraffe has given birth to a male fawn, which has been reared successfully, and is, probably, the first Giraffe that ever reached the adult state out of Africa, or in a state of domestication Among the donations are a Barbary Ape, two Lions and a Lioness, a pair of Leopards, a Black Bear from North America, a Lynx from Canada, two very small Zebus, an Australian Dog, three Esquimaux Dogs, two Manilla Bloodhounds, two Jerboas, a Sandwich Island Goose, a Dog faced Baboon &c The number of visitors to the Gardens during the year 1841 was 132,616, of whom 39,425 were privileged, and 93,191 unprivileged, being a decrease of 9895 in the former class, and an increase of 1502 in the latter, as compared with the previous year

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THE ABORIGINES OF BORNEO

It may be remembered that at the close of the year 1838, Mr James Brooke left England in the *Royalist* schooner, 142 tons, R Y S, with the intention of visiting Borneo* He arrived at Singapore early in 1839, and shortly after, crossed over to Sarawak, in Borneo, where he has since been engaged, making occasional returns to Singapore, and in one instance he made an expedition to Celebes, which occupied about six months Some valuable collections in natural history, and other scientific details, both from Celebes and Borneo, have been forwarded to this country by Mr Brooke

At the departure of our intelligent *voyageur*, his expedition, if we remember rightly, was regarded merely as a visit of curiosity, but we are happy to record that he is animated by a far more noble object—the improvement of the Borneons themselves, and, with this view, Mr Brooke has addressed a letter to Mr James Gardiner, in this country, who has promised to submit the same to Her Majesty's Secretary of State for the Colonies, Mr Brooke wishing it to be understood that on public grounds only, he requests the support of the Government, or the assistance of the commercial community We can, however, only refer to that portion of Mr Brooke's letter which contemplates "the amelioration of an interesting but most unhappy aboriginal race," *the Dyak tribes*, inhabiting the interior of the island, in subjugation to the Malays, who line the coast The latter people describe their inland neighbours in the darkest colours They are represented as considering a man unfit for matrimony, or any important function of life, till he has imbrued his hands in the blood of at least one fellow-creature, as so devoted to human sacrifice, that a number, even of the poorer class, will club together to purchase the cheapest man they can find, and offer him as a victim, that *they devour the flesh of their enemies, drink their blood, use their bones and sculls as ornaments, and even as money* Through hollow tubes they blow poisoned arrows, the wound of which is said to be mortal Mr Hunt accuses the Malays of exaggerating the offences of these poor savages, whose enmity they have justly incurred by driving them into the interior, and seizing every opportunity of catching and selling them as slaves Happily, Mr Brooke comes to the rescue of these oppressed creatures, and the following details of their true character, abridged from the letter already referred to, must command the interest and sympathy of every person of humanity, and, it is hoped, lead to the claims of the virtuous, but most unhappy Dyaks, meeting with the same attention as those of the African :—

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* See Year book of Facts, 1839, p 276

"The Dyaks," says Mr. Brooke, "by far the most interesting portion of the inhabitants, are confined almost entirely to the mountainous country, where they have fastnesses to which they fly on the slightest alarm. These people are mild, industrious, and so scrupulously honest, that a single case of theft has not come under my observation, even when surrounded by objects easily appropriated, and tempting from their novelty. In their domestic lives they are amiable, and addicted to none of the glaring vices of a wild state: they marry but one wife, and their women are quoted among the Malays, as remarkable for chastity; nor are they degraded, as in many communities. The *head-hunting*, or taking the heads of their enemies, is a feature in warfare by no means new or extraordinary: it is similar to the scalping of the North American Indian, and is a trophy of victory and prowess."

FOOD OF HERBIVOROUS ANIMALS.

On Oct. 17, M. Dumas read to the Academy of Sciences, at Paris,—a paper on the Food of Herbivorous Animals. M. Dumas states that he has ascertained that the quantity of fat in animals in a healthy state does not depend on some peculiar process in the digestion, but upon the quantity of fatty matter contained in the food that is eaten; and he gives an account of several practical experiments. He begins by stating, that on analysis of hay and maize, or Indian corn, he found the former yielded two per cent. of fatty matter, and the latter nine per cent. Herbivorous animals, says M. Dumas, always make less fat than the amount of the fat contained in their food; but the milch cow furnishes a larger quantity than any other animal, and the quantity of butter that she supplies, would, if weighed, be found equivalent to that contained in her food.

COLOURING OF BONES BY MADDER.

On Feb. 21, a discussion took place at the Academy of Sciences, at Paris, on the question of the Colouring of Bones in living animals by means of Madder mixed in the food administered; and which has been considered of importance, as showing the progressive growth of the bones. Messrs. Serres and Doyère now presented a memoir on a series of experiments on this subject, made by them; and inferred that the colouring of the bones penetrated into the osseous tissue to so small a depth, that the physiological importance of the phenomenon was greatly diminished, if not entirely set aside, by this fact; and also that the colouring was nothing more than an ordinary phenomenon of dyeing the bones.

WAPETI DEER.

Mr. L. T. Gaskell, of Liverpool, has exhibited to the British

Association, a gigantic pair of the Horns of the Wapeti Deer, brought from the western districts of America; the head being nearly three-quarters of a yard in length, with tufts of hair on each side, almost resembling the front mane of a lion; whilst the towering antlers were about 6 feet long from the base of the skull to the tip of the horn. Mr. Gaskell stated that these prodigious antlers were brought hither by Mr. D. Mossmore, an eminent naturalist, of the United States, along with the living male and female of the same species, (young ones,) which were in the possession of Her Majesty, in Windsor Park, to whom they were presented by the Earl of Derby.—*Literary Gazette*, No. 1329.

JAVANESE HORSE.

At Windsor Castle, is a Horse, supposed to be the smallest in the world. This little creature, well shaped, stands only 27 inches high; and is, consequently, overtopped by many Newfoundland and other dogs. It was brought from Java. On its arrival, the Captain took the little animal in a cab to the Mansion House, and galloped it in the saloon. Upon taking leave, he carried it down stairs.—*Athenæum*.

STRUCTURE OF THE EGG-SHELL.

On Oct. 19, was read to the Microscopical Society, a paper by W. B. Carpenter, M.D., "On the Structure of the animal basis of the common Egg-shell, and of the membrane surrounding the albumen." The author found on examining the thin membrane surrounding the albumen of the hen's egg, (*membrana putaminis*,) that it consisted of several laminæ, each lamina being composed of interlacing fibres, between which numerous interspaces are left; on comparing this with a portion of egg-shell decalcified by means of dilute acid, both presented the same structure, but the laminæ were numerous in the latter. He supposes that the deposit of calcareous matter takes place in the interspaces left by the reticulation of the fibres, and concludes that this fibrous membrane is analogous to the chorion of mammalia. A preparation showing the identity of the two structures accompanied the paper.—*Literary Gazette*, No. 1344.

THE FLORAKIN.

This bird is ranked first upon the game list in India, although it is exceedingly scarce. It is of the bastard genus, and is to be found in open champagne districts, affecting the same haunts and habits as does its congener in this country. The flavour of the Florakin approximates to that of the turkey, and the flesh is remarkably white. In plumage, it somewhat resembles that of the bittern. Owing to its extreme scarcity, there is not, perhaps, one European out of a thousand, who has resided for years in the East Indies, that has ever had an opportunity of witnessing this *rara avis*. There is a minor species of florakin, known by the name of "leek," which is occasionally to be found in the rice grounds. This is not so square as the former, but it is a delicious prize when obtained; and it is often mistaken for the florakin. There is an old saying current among Skirkarrees in India, that "he who can sport a florakin upon his table, may safely ask an emperor to dine with him."—*Correspondent of the Times*, Oct. 24.

THE NIGHTINGALE.

AT the late meeting of the British Association, it was stated, that the Nightingale, whose latitudes have been so often determined by popular inaccuracy, had been heard in Cornwall four years ago; and, in spite of all traditions to the contrary, the same sweet songster abounds about York.—*Literary Gazette*, No. 1329.

AIR-BLADDER OF FISHES.

ON July 20, was read to the Microscopical Society, a paper by Mr. John Quekett, "On the peculiar arrangement of the blood-vessels in the Air-bladder of fishes, and on the evidence they afford of the true function of that organ." The author, after alluding to three principal modifications of the air-bladder in fishes generally, went on to describe that of the cod-fish, which he stated to be a thick muscular bag, without any opening externally, and provided on its ventral aspect with a highly vascular body, which has been supposed to perform the office of secreting the air contained in the bladder. The author described the minute arrangement of the vessels in this so-called gland, the capillary system of which was composed of a great number of parallel vessels aggregated together in bundles, and forming loops at the free surface of the gland, and in the other part of the bladder the arrangement was also remarkable for the parallel manner in which the vessels were disposed; in this fish, three, but in others as many as six, vessels ran parallel to each other. The fact of the air-bladder being subservient to the function of respiration was supported to a certain extent by the distribution found in the anterior compartment of the air-bladder of the eel; in this fish, the vascular net-work approached more nearly that of the cellular lungs of the Batrachia than any other class of vessels. The author concluded by stating, that the probable use of the gland in the closed air-bladders might be, not that of secreting air, but of keeping in a pure state the air already there; as those fish provided with a gland generally live in deep water, and from having no outlet to the bladder are unable to change the contents, should they become impure.

PARASITES ON FISH.

MR. MOORE, of Manchester, has exhibited to the British Association, specimens of Parasites found on the salmon in fresh and salt water. They differ much in structure. The fresh-water parasite leaves the animal as soon as it arrives at the sea, but the parasite of the salt water remains on the animal a long time after it reaches the river. Specimens of the *Argulus foliaceus* were also exhibited, which attack the carp in the ponds of Manchester: although they attack the common carp, the gold and silver carp are quite free from their presence. Sir William Jardine has seen the salt-water parasite on the salmon 50 miles above the sea; and the abundance of these parasites is looked upon by the fishermen as an indication of the fish being in good condition. Dr. Lankester believes parasites to be rather the result than the cause of disease: a certain condition of the body attacked being necessary to the development and nutrition of the parasite.

ENORMOUS EELS.

On October 15, one of the largest Eels ever found in the Tay, was captured at Inchyra. It weighed 36½lb., measured 5 feet 7 inches in length, and 20 inches girth, at the thickest part.—*Tyne Mercury.*

On Oct. 22, some ballast-men, engaged in one of the Trinity lighters on the Thames, brought up in a scoop what they at first took to be a large snake, but which was soon ascertained to be an Eel, measuring 9 feet 6 inches in length, and 2 feet in circumference.

LARGE FISHES.

On April 2, Professor Jameson exhibited to the Wernerian Society, finely preserved specimens of the following large Fishes, taken lately in the Frith of Forth, and chiefly in Aberlady Bay:—1. A Tunny, 8 feet long, and 5 feet 6 inches in circumference where thickest; 2. Port-beagle Shark, 7 feet 3 inches long, by 4 feet in circumferenee; 3. Great Sunfish, 5 feet 2 inches in length, and 2 feet 8 inches in depth; and, 4. Conger Eel, 6 feet 6 inches long, 1 foot 10 inches circumference. The Professor also exhibited a beautifully spotted Seal, 5 feet 6 inches long, 4 feet 3 inches circumference, which had been entangled and drowned in a herring net off Inchgarvey, near Queensferry.

THE "SEA CUP."

A paper has been read to the British Association "On the Nidus nd Growth of the *Purpureus lapillus*, and also on the *Patella pelucida* and *P. levis*, by C. W. Peach. From a series of observations, Mr. Peach concluded, that the "Sea Cup" does not belong to the *Turbo littoreus*, but to the *Purpureus lapillus*; he stated that he ad seen the *Purpureus lapillus* employed in the formation of these nteresting fabrics, and that on pulling these shells from the rocks on hich they were fixed, he found that they enveloped three or four of hose cups with their mantles, and that there were indentations in he mantle answering to the number of cups which it had covered. hese "sea cups" are firmly attached to the rocks, and when left by he whelks, the mouth is securely sealed up; they are then of a pale ellowish colour; after some time, the internal part assumes a granular appearance, and is of a pinkish hue. The young fry leave their abitat at the end of about four months, and take refuge in the crevices and shelter afforded by the sea weeds and shells attached to the rocks. The author exhibited specimens in all the various stages of growth, and amongst them some young shells which had been reared in his house, from the nidi kept in a dish of salt water, and which had all the peculiarities of the adult; leaving no doubt that they are the *Purpureus lapillus*, and therefore that the "sea cup" does not belong to the periwinkle, as stated by Ellis. The author also stated, that from a series of observations and examination of thousands of specimens, in all their various stages of growth, he does not hesitate to say, that the *Patella levis* is the young of the *Patella pellucida*. Mr. Peach stated that he had found the ova of the *Purpureus* from January to March.—*Athenæum*, No. 770.

THE PEARLY NAUTILUS.

On Oct. 25, Professor Owen exhibited to the Zoological Society, a specimen of the Pearly Nautilus, *(Nautilus Pompilius,)* animal and shell, obtained by Captain Belcher, R N., at Amboyna. He alluded to the fact of the specimen described by him in 1832 having been detached from the shell, which was destroyed in the capture; he recapitulated the analogies which had guided him in determining the position in which he had restored the soft parts to the shell, and figured them *in situ*, in his memoir. Objections had been made to this restoration by Mr. Gray, and by Doctors Grant and De Blainville, who were led by other analogies to believe that the upper or outer lip of the shell must have crossed the back of the head, instead of crossing the opposite side, or funnel, as represented by Mr. Owen M Valenciennes, who had subsequently received the soft parts of a nautilus, had adopted the position assigned to them by Mr Owen. The present example, in which the animal had been restored to its shell in precisely the same position in which it was received when recent, closely agreed with the description and figure in Professor Owen's work. The involuted spire of the shell is covered by the dorsal fold of the mantle, and is lodged in the concavity at the back of the muscular plate above the head The funnel rests upon the outer wall of the large chamber containing the animal This appears to be the first specimen of the Pearly Nautilus in its shell which has reached Europe.—*Athenæum*, No. 784.

NEW SPECIES OF MOLLUSCA.

Mr. Allder, of Newcastle, has read to the British Association, a description of three New Species of Mollusca of the genus Eolis, lately found by Mr. Albany Hancock, on the coast of Northumberland he also exhibited drawings by that gentleman of these, as well as of some other new species of Nudibranchia, descriptions of which had appeared in the *Annals of Natural History*. Mr. Allder took the opportunity of stating, that Mr. Hancock and he were still pursuing their examination of the British species of this order, and but lately had a further opportunity of confirming the fact of the existence of eyes in the genus *Doris*, having found a young specimen of the *Doris depressa*, in which the eyes were very distinct He stated that they had made some examinations with the microscope of the elegant appendage in Melibæa, Tritonia, and Eolis, which are usually considered to be branchiæ They found that in *Melibæa ornata*, vibratory cilia existed all over the body, but in a less degree in the supposed branchiæ than in other parts, and that an individual deprived of these appendages lived several days afterwards without apparent diminution of activity,—thus proving that these were not the animal's only means of respiration —*Athenæum*, No 770.

COSTE ON FRESH-WATER POLYPI

THE researches of the author on these animals are of the greatest importance, inasmuch as, after having entered upon the complicated organization of the various species of *Polypi*, the general binary disposition of their organs, the position of their nervous system, and after considering, also, that they have mouths, in many respects analogous to those of the *Mollusca*, and that, like them, they produce the envelope which protects them, and when to these are added certain special facts which the *Cristatella* present, as, for example, having a foot which is everywhere contractile, and their secreting, like the *Gasteropoda*, a copious viscid matter, we shall be led not only to associate them with the class of the *Mollusca*, but likewise to introduce along with them all the animals which are further down in the scale Before, however, maintaining this as an irrefragably established fact, we shall request another opportunity of explaining some additional results —*Microscopic Journal*, No 15

HOW SERPENTS CREEP

CREEPING is the most general mode of progression among Serpents this act is produced by a series of successive contractions communicated to their long spine by the numerous muscles inserted in the vertebræ or ribs In order to understand rightly how this act, or *reptation*, takes place, we must suppose that the animal, being stationary, or having made a momentary pause, has halted on a surface more or less resisting, on which it finds a point of support Most commonly it is the belly or under part of the body which is applied to such support It first raises the posterior moveable edge of one or more solid horny plates, with which the abdomen and tail are furnished in such a way as move forward the plates which are situated further forward, on which it then seems to glide, then successively on all those which precede, for these plates act by means of the ribs, which are inserted into them, so that they move like so many feet, which would nearly correspond with those we observe in the body of Juli, and other myriapodous insects These movements taking place at the sametime, and in the same manner, follow each other regularly, and are repeated in a beautiful successive order along the whole length of the inferior region of the body We may thus conceive how the direct displacement of the mass is produced, as it is necessarily urged from behind forward, so that the head is carried more and more in advance, and the tail follows nearly in the same direction. This progression, however, in the greater number of cases, takes effect at the same time on the lateral parts of the body, by a series of undulations or sinuosities, which obtain for the serpent points of support on the objects which present some resistance to it on the right or left. It may then be observed to curve its spine regularly, according to its length, to produce sinuous and arched lines in it; which are successively effaced, become formed anew, and reproduced as often as the obstacle encountered continues to offer resistance to the pressure. This is the mode we observe in eels, as well as in certain saurians with a very long body, and destitute of feet, such as the species of the genus Anguis; and it is, therefore, likewise called, when it takes place among these animals, a serpentine motion. Such is the mechanism of creeping, or reptation.—Abridged from a manuscript chapter of the 6th volume of a work entitled *Erpetologie Generale*, by MM. Dumeril and Dibron, published in *Comptes Rendus*, No. 12, Sept. 1841; and translated in *Jameson's Journal*, No. 64.

CIRCULATION OF INSECTS.

M. Dufour has submitted to the Academy of Sciences, at Paris, a series of "Anatomical and Physiological Studies of a Species of Musca, with the view of illustrating the History of Metamorphoses, and the Pretended Circulation of insects." He concludes thus:—

On taking a review of the dorsal organ in the various orders of hexapod insects, we find in all the following characters: 1st, It is situated in the median dorsal line of the body, immediately beneath the integuments; 2nd, its axis, which is more particularly the heart, or the dorsal vessel of authors, is a fibro-fleshy simple cord, without divisions, openings, or cavities: 3rd, it is fixed and closed at the two extremities: 4th, its abdominal portion is furnished at the sides with wings, sometimes membranous, cut or entire, or fixed with ligaments, (as among the *Hemiptera*,) under the form of a narrow line or border, without any means of connexion from one to the other; 5th, the most skilful dissections, the most delicate injections, have never detected the least vascular ramification in this organ; and all anatomists have admitted this negative fact, which is of such high importance in reference to the question of circulation.

The movements of the dorsal organ, which have been so imprudently designated by the names of *systole* and *diastole*, and the agents which determine them, have been the object of M. Dufour's attentive study. They are either wanting, or very difficult to be determined, in many insects. The general movements are principally regulated by the ligaments, the muscles attached to the skin, the tracheæ put in motion by the action of the respiration, and the fluctuation of the nutritive liquid. Its proper movements, or *pulsations* (an inapplicable term), depend principally on the contractibility of the fibres. These movements are irregular, and Malpighi has even said that he has seen them in the same individual, sometimes directed from the anterior part backwards, and at other times from the hinder part forwards, a grave testimony against a circulating system.

What adds still further to the numerous proofs of the non-existence of a heart and circulating system in insects is, that immediate death does not ensue from cutting the supposed heart through the middle, while the same operation, performed on the dorsal vessel, the true heart of a pulmonary Arachnid, instantly destroys life.

M. Dufour concludes from his dissections, experiments, and reasonings, that the existence of an acriferous vascular system adapted to convey the physiological benefits of respiration to all the organs and tissues, is incompatible with the presence of a circulating humour. He is satisfied that the latter does not exist in insects provided with tracheæ, and that the organ which has been supposed to perform this function is merely rudimentary, bearing some resemblance to the heart of the Arachnidea, in fact, an obsolete heart, an organ deprived of every well determined physiological attribute, and perhaps a mere elementary tissue.—From *Les Annales des Sciences Naturelles*, tom. xv. p. 5, *Jameson's Jounal*, No. 63, *abd.*

NEST (?) OF AN INSECT ON THE HUMAN HAIR

On examining some Human Hair with the microscope, Mr. D. Cooper, of Chatham, was somewhat surprised to observe a small elongated cup-shaped Nest, of a white colour, and much resembling, when viewed with the naked eye, a scale of epithelium. It was situated within a quarter of an inch of the bulb of the hair, and projected from one side; its form resembled that of the calyptra or cup of a moss; there was a decided opening at the apex, which was furnished with a well-defined rim or margin; the orifice was filled with a number of small oval or roundish particles resembling eggs; these were piled one above the other in a conical manner. The whole interior appeared filled with similar bodies, which were easily recognisable through the diaphanous parietes of the receptacle. The nest, should such it be, was attached by means of a prolongation of its lower part, which encircled the hair, much in the same manner as wasps and some birds fix their nests to the branches of trees. Its size as far as could be judged was about $\frac{1}{50}$th of an inch long, by about $\frac{1}{300}$th of an inch broad.—*Microscopic Journal*, No. 18.

PARASITES ON SPIDERS

Mr. Blackwall has also read to the British Association, an "Account of a Species of Ichneumon whose Larva is parasitic on Spiders." Immature spiders of the species *Epeira antriada* and *Epeira cucurbitina*, and adults of the species *Linyphia minuta* and *Linyphia pusilla*, are frequently infested by the larva of a small ichneumon, which feeds upon their juices, and ultimately occasions their death. When about to assume the pupa state, it kills the spider, which has supplied it with sustenance, by rapidly exhausting its physical energies; and quitting it, constructs on some adjacent object a cocoon of a quadrilateral figure tapering to its extremities, which is composed of a pale yellowish white silk of a compact texture. After a lapse of a month nearly, the perfect ichneumon issues from the cocoon, and prepares to carry on the work of destruction assigned to its species; a preliminary step towards which is the deposition of her eggs by the female on the bodies of her victims, care being taken that one only is attached to the same spider. Mr. Blackwall thought it probable that the whitish oval object noticed by Baron Walckenaër on a specimen of *Linyphia montana* (Histoire Naturelle des Insectes Aptères, tom. 1. p. 176), which seems to have been the occasion of much surprise and perplexity to that accomplished arachnologist, was the parasitic larva of a small species of ichneumon.—*Athenæum.*

AGE OF SPIDERS.

MR. BLACKWALL has read to the British Association a paper on the Palpi of Spiders; in which the practical result of most consequence appears to be, that the full development of the palpal organs indicates a state of maturity in male spiders: and this knowledge will be useful in preventing the arachnologist from falling into the too common error of mistaking young spiders for old ones, and of describing them as distinct species.

THE SILK-WORM.

RAUMER quotes the following curious fact from Berger's book: "24,000 eggs of the Silk-worm weigh a quarter of an ounce; the worm lives from 45 to 53 days; increases his weight in 30 days 9,500 fold, and during the last 28 days of his life eats nothing. For 739lb of mulberry-leaves, 70lb of cocoons are obtained; 100lb of cocoons give 8$\frac{1}{3}$lb of spun silk; and one pound of cocoons will produce a single thread of 88,000 fathoms in length."

ORGANIC TISSUES IN CORALLIDÆ.

MR. J. S. BOWERBANK has lately read to the Royal Society, a Memoir "On the Organic Tissues in the bony structure of Corallidæ." The author submitted small portions of nearly 70 species of bony coral to the action of nitric acid, and thus obtained their animal tissue, freed from calcareous matter, and floating on the surface of the fluid in the form of a delicate flocculent mass. By the aid of the microscope, this mass was found to be pervaded by a complex reticulated vasculated tissue, presenting numerous ramifications and anastomoses, with lateral branches terminating in closed extremities. There were also found interspersed, among these, another set of tubes, of larger diameter than the former, and provided, in many places, with valves; the branches from these larger vessels occasionally terminate in ovoid bodies, having the appearance of gemmules or incipient polypes. In other cases, masses of still larger size, of a more spherical shape, and of a brown colour, were observed attached to the membrane, and connected with each other by a beautiful network of moniliform fibres. Numerous siliceous spicula, pointed at both extremities, and exceedingly minute, were discovered in the membranous structure of several corals, and also spicula of a larger size, terminated at one extremity in a point, and at the other in a spherical head, a form bearing a striking resemblance to that of a common brass pin. Besides these spicula, the author noticed in these membranous tissues a vast number of minute bodies, which he regards as identical with the nuclei of Mr Robert Brown, or the cytoblasts of Schleiden —*Jameson's Journal*, No. 65.

PHOSPHORESCENCE OF ZOOPHYTES.

THE Rev D. Landsborough, of Stevenson, in Ayrshire, from experiments with several specimens of marine Zoophytes, surmises that the power of emitting phosphoric light is more generally possessed by the inhabitants of the deep than we are apt to imagine He observes "We are not entitled to say that it is possessed by all the little *Medusa*, which, as transparent jellies, abound in the sea, but as it is known to be possessed by some of them, may they not in general be phosphorescent when agitated? And, as they are at times very numerous in the sea, may not the beautiful phosphorescence of sea-water at certain seasons, when put in motion, be owing to them and to marine Infusories, which in countless numbers are found in the deep? And, is it certain that it is not possessed by some fishes? The first time I spent a summer night at sea was in the herring-fishing season, and the sailors showed me how to ascertain whether the herring shoals were near at hand. When a smart flow was given to the vessel, the percussion was communicated to the deep, and immediately a flash of light was seen at a considerable depth, and this the sailors assured me was from the shoal of herrings If this was phosphoric light emitted by these finny wanderers, then is this phosphorescent quality possessed by Zoophytes, *Medusæ*, *Mollusca tunicata*, and fishes"—*Annals of Natural History*. *Jameson's Journal*, No 63, *abd*

EXTENT OF THE OVA OF AN ACARUS.

It may be interesting to microscopic observers to be informed, that the pebbles of the gravel on Blackheath and the neighbourhood, are at the present time abundantly covered with the Ova of the Acarus lately described by Mr White, and formerly considered as a fungus under the name of *Craterium pyriforme*

Before the late rains, these bodies were to be seen on pieces of wood and many other substances, as the stalks of plants, &c, as well as on the pebbles We have lately seen specimens of the same deposit on pebbles, from Lincolnshire and from Devonshire or Cornwall in the neighbourhood of Plymouth, from which it would appear to be very generally distributed throughout the country It may not improbably, perhaps, prove to be the ovum of the harvest bug, (*Acarus Autumnalis* of Shaw)—E. M J —*Microscopic Journal*, No 20, October

CIRCULATION IN THE INFUSORIA.

DR ERDL, of Munich, in a letter to Professor Muller, says "I have very often seen and shown to my friends about here a kind of circulation in the Infusoria, a phenomenon so remarkable that I cannot but wonder that it is not mentioned by any microscopic observer. I find it most distinctly in the *Bursaria vernalis*, whose abdomen, you know, appears to be quite full of green globules Of these globules, those which lie near the periphery of the animal are incessantly moving, whether the animal itself be still or not, in an elliptic current upwards and downwards In this current, three or four globules always lie close by one another, and move together with the stream It has no relation whatever to the vivid ciliary motion that is constantly going on at the outer surface "—*Muller's Archives*

INFUSORIA IN THE CANTON RIVER

FROM comparison with M Ehrenberg's great work upon Infusoria, it would appear that most of the forms observed at the island of Lantoa, situated at the mouth of the Canton river, and at Chusan, also inhabit Europe The new forms added, as "dubia," are those to which Dr Castor has found none corresponding among Ehrenberg's

From what has been stated, it will appear, that Indian forms (to which may be added a few Javanese,) prevail in the fauna of Chusan, and that European forms make but a secondary feature —*Annals of Natural History*, July

INFUSORIA IN WATER FROM AFRICA

ON April 27th, was read to the Microscopical Society a communication from G Bush, Esq , entitled "Observations on some Infusoria contained in Water from Africa" The water was procured from two localities, and contained thirteen species of Infusoria, all of which, except three species, were common in ordinary water the other three, which were of the genus Eunotia, were precisely similar to those discovered by Ehrenberg, as fossils in the Bergmehl of Sweden , but lately he has detected them in the recent state in earth from the neighbourhood of Labrador , thus having two localities of very different conditions as to climate, for the same species of Infusoria, which, the author states, would tend to prove that no certainty as to climate could be deduced from the occurrence of fossil Infusoria

INFUSORIA IN THE NORTHERN SEAS

ON Jan, 26, was read to the Microscopical Society, a paper by Mr John Quekett, "On the Presence, in the Northern Seas, of Infusorial Animals, analogous to those occurring in a Fossil State at Richmond, in America" After alluding to the discoveries of Prof Ehrenberg in his department of science, the author proceeded to mention a stratum of fossil animalculæ twenty feet thick, recently detected by Prof Rogers, underlying the city of Richmond, in America it contains beautiful specimens of Naviculæ, Actinocycli, Gallionellæ, &c , but the most remarkable form is a circular disc, with markings very similar to those on the back of an engine-turned watch. On examining the sandy matter which had been washed from some Zoophytes brought home in spirit by the Northern Expedition, under Capt. Parry, in 1822, the author detected more than six animalcules in it precisely analogous to those occurring as fossils in the Richmond sand, and amongst these the engine-turned discs; these last occur in the fossil state singly, very rarely in pairs, and some doubts have arisen as to their correct nature; but the investigations of the author have led him to consider them as a species of bivalve, and many, both with and without markings, are to be found in the recent state, inclosing granular matter between their valves. The smallest specimens were often seen to be adhering to fragments of sea-weed by a small stem or pedicle.—*Athenæum*, No. 745.

EHRENBERG'S DISCOVERY OF LIVING INFUSORIA IN BEDS IN AND AROUND BERLIN.*

M. DE HUMBOLDT has lately presented to the Academy of Sciences, at Paris, on the part of M. Ehrenberg, specimens of the turfy and argillaceous bed which, at the depth of twenty feet below the pavement of the city of Berlin, was found filled with Infusoria, still in a living state, and having their ovaries perfectly preserved. The marks of this subterranean life are observable eight feet below the bottom of the Spree. Since M. Ehrenberg pointed out, in 1836, immense masses of fossil infusoria, and the siliceous and calcareous envelopes of microscopic animals in particular geological formations of very recent date, then in chalk, in the oolitic limestone of Cracow, and even in the more ancient (transition) limestones of Russia, he has ascertained that organic agents are still so active in mud taken from rivers and harbours, that, for example, of a mass of 2,592,000 cubic feet, taken in 1839, and 1,728,000 cubic feet taken in 1840, from the harbour of Swinemunde, on the shores of the Baltic, the one-half, or at least the one third, was composed of microscopic organisms. The landes or heaths of Luneburg contain a bed of fossil infusoria twenty-eight feet thick. In the strata found at Berlin, extending to twenty, and in some localities, (in the form of a funnel,) even to sixty feet in depth, a great number of Gallionellæ are met with, having their cells filled with green eggs. The animals cannot come in contact with the oxygen of the air in any other way than by means of the water which moistens the turf; but we cannot doubt that they have the power of multiplying. In the subterraneous Naviculæ, spontaneous movements have been at times seen, but those movements were much slower than in the Naviculæ found near Berlin on the surface of the ground. The greatest number of forms in the subterraneous bed are not found either near Berlin or in the Baltic Sea, but in the neighbourhood of P[illegible], among the strata of fossil infusoria, which alternate with lignites and beds of freestone. The slender spines so characteristic of marine sponges likewise abound, and appear to indicate that this extraordinary phenomenon is of pelagic origin. In some quarters of Berlin, the solidity of buildings is endangered by this bed of living infusoria. M. Ehrenberg presents at the same time an extract from five memoirs; his observations embracing the most distant countries, Dongola, Nubia, the delta of the Nile and its mud, the infusoria of North America, (214 species, of which 94 are living and 120 fossil,) Siberia, the Malvina and Marianne islands. M. Ehrenberg intends to publish a great work in folio, similar to his magnificent publication on living infusoria, entitled—*Forms of Life and Primitive Organization in the Solid Part of the Crust of the Globe.—Comptes Rendus, Jameson's Journal*, No. 63.

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* Similar beds occur near Edinburgh, as on Arthur's Seat.—*Prof. Jameson.*

FORAMINIFERA OF AMERICA AND OF THE CANARY ISLANDS.

Alcide d'Orbigny, celebrated for his travels in South America, has lately published three long essays on the imperfectly known class of the *Foraminifera*. Of these memoirs we find a most interesting *precis* in *Jameson's Journal*, No. 63, whence we quote a few striking facts.

The sand of all sea-coasts is so filled with those microscopic animals termed *Foraminifera*, that it is often half composed of them. Plancus counted 6000 of them in an ounce of sand from the Adriatic Sea: we ourselves, (says M. d'Orbigny,) have reckoned 3,840,000 in an ounce of sand from the Antilles. If we calculate larger quantities, as for example a cubic yard, the amount surpasses all human conception, and we have difficulty in expressing the resulting numbers in figures. And yet, how insignificant is all this when we regard in the same point of view the whole enormous mass of the sea-coasts of the Earth! We thence deduce the certainty that no other series of beings can, in regard to number, be compared to the group we are now considering, not even the myriads of minute crustacea which colour large spaces on the surface of the sea, and which afford nourishment to the largest animals, viz., the whales, and not even the infusory animals of fresh water, whose shields partly compose Tripoli: for these are limited in their distribution, whereas the *Foraminifera* occur on all coasts.

Many of these minute animals do not attain a half, a fourth, or a sixth of a millimetre in size. The author has examined the sand of all parts of the earth, and found that it is the remains of the *Foraminifera* which constitute, in a great measure, banks that interrupt navigation, which stop up bays and straits of the sea, which fill up harbours, and which, together with corals, produce those islands that rise up in the warm portions of the Pacific Ocean. When we regard the influence of the *Foraminifera* on the strata of the crust of the globe, we become so much the more convinced of what we have said as to the living species, and it is easy to adduce facts to shew that they contribute much to the formation of whole deposits. Beginning with the newer epochs, the tertiary formations, we have, above all, a striking case in the environs of Paris. The *Calcaire grossier* of that extensive basin is, in certain places, so filled with *Foraminifera*, that a cubic inch from the quarries of Gentilly afforded 58,000, and that in beds of great thickness and of vast extent. This gives an average of about 3,000,000,000 for the cubic metre, a number so great as to preclude further calculation. We can hence, without exaggeration, conclude that the capital of France, as well as the towns and villages of the neighbouring departments, are almost entirely built of *Foraminifera*. This group of animals is not less abundant in the tertiary formations extending from Champagne to the sea, and its numbers are prodigious in the basins of the Gironde, of Austria, of Italy, &c. The cretaceous beds likewise contain myriads, as is proved by the nummulitic limestone of which the greatest of the Egyptian pyramids is built, and by the vast number of these bodies of which the white chalk from Champagne in France across to England is composed. We find also *Foraminifera* down to the lowest beds of the Jura formation. Thus, have these shells, although hardly perceptible to the naked eye, altered not only the depths of the actual ocean as it now exists, but also, previously to our epoch, formed mountains and filled up basins of great extent.

Opposite Cape Horn, at a depth of about 160 metres, the bottom of the sea was examined by means of a sounding lead having a diameter of only a few centimetres and yet this small surface yielded a considerable number of *Foraminifera* and *Polypi*. This is a fact of great importance, because it proves that these animals can live in great depths of the sea and gives us an idea of the innumerable multitudes of these beings in such cold regions. The bottom of the sea must in the strict sense of the word, be covered with them, in order to be able to furnish more than forty individuals to so small an object as the sounding lead.

Of the eighty-one species observed on the coasts of South America fifty-two occur in the Atlantic Ocean, without even one of them presenting itself in the Pacific, and thirty are peculiar to the Pacific without a single individual of them being found in the Atlantic Ocean. The only species common to the two seas, (*Globigerina bulloides*,) lives not only on both coasts of America, but also in the Canary Islands, in the Mediterranean Sea, and even in India. As it occurs everywhere it does not alter the well grounded results.

It is proved by the comparison of species, that the two coasts of South America present, as regards the *Foraminifera*, two entirely distinct and yet contemporaneous faunas. If we compare the species of the south coasts of the Atlantic ocean with those of the Antilles, or with the equatorial fauna, which includes one hundred and eighteen species, we find that among the latter there are none of the species of the south coasts, and although both series are in the same ocean, yet they are totally distinct. This result may be applied directly to the geology of the Tertiary period, and proves, that at inconsiderable distances on the same continent, entirely different and yet contemporaneous faunas may exist. Different basins, therefore, which contain different species, may thus belong to the same epoch.

The *Foraminifera* of the Canary Islands, forty-three in number, having been investigated from too limited materials, we may suppose that a much larger number will yet be discovered. In regard to their geographical distribution, the following conclusions have been deduced: The *Foraminifera* of the Canary Islands, which are common also to France, are seven, and form nearly the sixth part of all the species. They may be divided into three series according to their mode of occurrence, viz., 1. On the coasts of the ocean alone; 2. On the coasts of the Mediterranean; and, 3. On the coasts of the ocean and of the Mediterranean.

We subjoin M. d'Orbigny's definition of the group:—"The *Foraminifera* are very small, microscopic, non-aggregated animals, which invariably possess a separate individual existence. They have a coloured jelly-like body, which is either entire and rounded, or separated into sections, which lie in simple or alternating lines, are spirally rolled up, or wound round an axis. This body is contained in a chalky, rarely cartilaginous covering, which is formed according to the segments of the body, and completely corresponds to the shape of the latter. From one or more openings or pores of the last segment of the covering, there project contractile, colourless, very long, thin, subdivided and branched threads, which serve as organs of motion."

BOTANY.

CONFORMITY OF STRUCTURE AND GROWTH IN ANIMALS AND PLANTS.

M. Schwann's Microscopical Researches on this subject must be ranked amongst the most important accessions that have been made to physiology. They enable us to establish a theory of organic action and its development, an object which had not been previously attained.

The most recent discoveries in the physiology of plants have demonstrated that the formation of the cellular tissue, the fibres, vessels, and spiral vessels, is reducible to that of cells. The origin of cells has been illustrated by an important discovery of M. Schleiden's—(Muller's *Archiv* 1838, p. 137.) His starting-point is what R. Brown calls the nucleus of the cell, which M. Schleiden names, for this reason, *cytoblast*. Its colour is most commonly yellow, its internal structure granular. Schleiden has even discovered, in the interior of the cytoblast, a corpuscle, the corpuscle of the nucleus, which appears sometimes in the form of a spot, sometimes under that of a hollow globule. These cytoblasts are formed freely in the interior of the cells, among a mass of minute mucous globules; as soon as they have attained their full growth, a very small transparent vesicle rises on their surface, which is elevated above the cytoblast like a watch-glass above the dial-plate.

In proportion as this cell enlarges, the cytoblast appears like a body enclosed in one of the walls of the young cell; its wall, on the inner side, is extremely thin, and, as it were, gelatinous; it can seldom be observed, and is soon absorbed with the cytoblast. The young cells are free in the mother cell, and assume a polyhedral form by pressing closely against each other. Now, this is in what M. Schwann's discoveries essentially consist, regarding the cells of animals, and the primitive conformity of structure between animals and plants.—See the entire paper, translated from *Les Annales des Sciences Naturelles*, *Jameson's Journal*, No. 65.

DEVELOPMENT OF PLANTS.

At a recent sitting of the Academy of Sciences, at Paris, M. Payen described the results of his late researches respecting the Development of Plants According to the theory of M. Payen, resulting from former experiments, the substance which forms the elementary membranes of the tissue of all plants is the same in every species of vegetable. It contains only three elements combined, and in these proportions, viz., of carbon 45, and of hydrogen and oxygen in the proportion in which they exist in water, 55. M. Payen calls this primary substance of vegetables, *cellulose*. If this composition change ultimately, the change is owing to the fresh coats of cellulose, deposited by the progress of vegetation, being incrusted with many other organic substances, such, for example, as those to which wood owes its hardness. —*Comptes Rendus*, *Microscopic Journal*, No. 14.

CRYSTALS AND OTHER INORGANIC DEPOSITS IN PLANTS.

The greater number of the white points visible on the outer integument of the bulb of *Muscari comosum*, consist, according to Goeppert, of larger cells, which are aggregations of four-sided prismatic crystals, placed nearly parallel to each other, and pointed at both ends. Payer also (Froriep's *Notizen*, No 335, pp. 65-68), has examined a number of these deposits in plants; as, for instance, in the leaf stalks of several species of *Ficus*, *Parietaria officinalis*, &c., *Urtica nivea*, and *Forskalea tenacissima*. Others more cylindrical, in *Celtis Australis*, and *C. Mississippiensis*, and those in the leaves of *Morus nigra*, *M. alba*, and *M multicaulis*. They are found at the base of the hairs in *Broussonetia papyrifera*, and *Hamulus Lupulus*, and *Cannabis sativa*, and are peculiarly remarkable in the leaves of *Conocephalus Naucleiflorus*. A single large leaf of the *Broussonetia papyrifera* contains 131,000 of these concretions. Carbonate of lime is frequently met with in these deposits, between the cells of the parenchyma of the leaves, or their ribs, in the ducts of the leaf-stalk and its base. It is present in these situations, even in leaves of so acid a juice, that this would necessarily dissolve the carbonate of lime, were they in contact Oxalate of lime, which is usually distributed in the leaves of plants, appears, as in the stems of *Cactus*, in transparent aggregated crystals, in the form of spheroids covered with points, also enclosed in a membrane, and sometimes also as octahedral or octangular prisms. *Raphides* consist of an investing membrane filled with oxalate of lime. Silex incrusts many vegetable membranes, and is seen also in the shape of orbicular concretions.—*Microscopic Journal*, No. 11.

SULPHUR IN PLANTS.

M. Vogel, sen. remarks, that it has been proved by the late Mr. Planche, and other chemists, that many Plants contain Sulphur. Water cresses, *Lepidium sativum, L.* are among those which especially contain sulphur.

As soils distant from volcanoes do not contain perceptible traces of sulphur, it appears to M. Vogel not impossible that plants, which are much disposed to assimilate sulphur, may have the property of deriving it from the decomposition of the sulphuric acid of sulphates. M. Vogel, however, found that seeds, placed in the soil perfectly free from sulphur or sulphates, yielded plants which contained a notable quantity of sulphur: such were water-cresses. As an approximate result, M. Vogel states, that 100 grs. of water-cress seeds contained 0·129 gr. of sulphur.

As the growth of the young plants of water-cresses took place in a soil devoid of sulphur and sulphates, and in a room which contained no sulphureous vapour, the origin of the sulphur, M. Vogel remarks, is to him a perfect enigma; and at present, he confesses that he is unable to give a satisfactory explanation of it.—*Journal de Pharm. et de Chim.; Philosophical Magazine*, No. 135.

ACTION OF SALTS ON LIVING PLANTS.

From the various experiments which M. Vogel, sen. has made on the Action of Salts on Living Plants, he has arrived at the following conclusions:—

1st. That plants with their roots immersed in a solution of sulphate of copper totally absorb the salt, convert it into protosulphate, and die quickly.

2nd. That acetate of copper produces the same effects, the salt absorbed becoming proto-acetate of copper.

3rd. That plants absorb sulphate of magnesia, nitrate of potash, and iodide of potassium, and die more or less quickly.

4th. That the sulphate of zinc and manganese are absorbed by plants without suffering decomposition, and the plants die.

5th. That plants absorb nitrate of cobalt and nickel, without being able to absorb the whole of them from solution; but they die; and the same effect is produced by emetic tartar.

6th. That the oxalate and tartrate of oxide of chromium and potash are slowly absorbed by plants, and the bichromate of potash much more quickly. The *Datura Stramonium* and *Galega officinalis* absorb the salt of chromium with the greatest rapidity; they become of a yellow colour and die.

7th. That plants absorb nitrate of silver; but they decompose it, and the oxide of silver is reduced to the metallic state.

8th. That plants absorb also, and totally, the proto-nitrate of mercury from solution, but the salt is decomposed.

9th. That corrosive sublimate is absorbed by plants: some of them decompose it into calomel, and others absorb it without decomposition.

10th. That plants slowly absorb acetate of lead; and it is decomposed by some plants and not by others.

11th. That plants which contain much carbonate of lime, such as the *Chara vulgaris* and the *Straticles aloïdes*, do not absorb a salt of copper from solution: the same also occurs with the *Cereus variabilis.—Journal de Pharm. et de Chim.; Philosophical Magazine*, No. 135.

Gilgenkrantz has seen a plant of the genus *Leptomites* or *Hygrocrocis* form in a solution of arsenic. This observation proves, that arsenic, a substance so very poisonous, and supposed to be destructive to all organized bodies, is, however, favourable to the vegetation of some plants. M. Bory St. Vincent also states, that M. Dutrochet had observed, about ten years ago, the development of a similar plant in a solution of the acetate of lead.—*Journal de Chimie.*

BOTANICAL CLINATOLOGY.

M. AUGUSTE DE ST.-HILAIRE, in a Memoir read by him to the Academy of Sciences, at Paris, many years since, stated, that, after having left at Brest, on April 1, the peach-trees without leaves or flowers, he met with them at Lisbon, eight days later, entirely covered with flowers; and the same thing was observed with *Cercis*, many species of *Lathyrus*, *Vicia*, *Juncus*, &c. On the 25th, at Madeira, the peaches were fully formed, and the wheat in ear; lastly, on the 29th, at Teneriffe, the harvest was commenced, and the peaches were fully ripe. In a journey taken by M. de St. Hilaire, in 1841, he may be said to have noticed the vegetation in an inverse sense. On the 10th of August, the oat harvest was completed in the vicinity of Orleans; on the 23rd it terminated between Beauvais and St. Omer; on the 31st, between Hamburgh and Lubeck; on the 2nd of September, cherries were still on sale in the Copenhagen market; on the 27th the oat harvest was finished in the country around Christiania; and from the 10th to the 18th, M. de St. Hilaire observed it in progress between that town and Trondhjem, in the 64th degree. It would be natural to suppose that, in returning from the latter town to Christiania, M. de St. Hilaire should find the same harvest completely finished; but, on the contrary, during the whole of his journey between Trondhjem and Christiania, the oat harvest was still going on, as it had been when he went from Christiania to Trondhjem. Those who have traversed mountainous countries, and who are acquainted with the influence of secondary causes in such places, will not be surprised at these apparent singularities. Thus, in Hedemarken, a very moist plain, the seed-time is extremely late; and, consequently, the harvests are so likewise. On one of the banks of the great lake Miösen, the harvest is much earlier than on the other bank, the former having a southern exposure.

It is known that, in northern countries, the shortness of the summer is compensated by the length of the days, and that in them vegetation goes through its various states in a much shorter time than in more southern regions. On leaving Christiania, on September 10, it was nearly in the same state as in the middle of France during the last weeks of the same month; at Roraes, one of the most elevated points of the Scandinavian chain, where the mercury freezes every year, and where the *Betula nana* grows in abundance, vegetation appeared on the 14th of September, in the same condition it exhibits in France in the earlier weeks of November; that on the banks of Gudelf, at a little distance from Trondjhem, had reached the same point on September 20, as that of France during the last weeks of October; finally, at Dovrefield, at a height of 3000 feet above the level of the sea, vegetation appeared on September 22, such as we see it in Sologne in the earliest days of December.—*Comptes Rendus*; *Jameson's Journal*, No. 63, *abd.*

SHOWERS OF POLLEN.

THE *American Journal of Science and Arts*, for January, 1842, contains some interesting remarks relative to two Showers of Pollen; one of which fell at Troy, New York, the other in the harbour of Picton; a portion alighting upon a vessel in the harbour on a serene night in June, and having to be collected and thrown over by the bucket-full in the morning. A small quantity of each of these powders was preserved, and sent to Prof. J. W. Bailey, to submit to microscopic examination. This gentleman ascertained that the powder which fell at Picton was wholly composed of the pollen of a species of pine, and that from Troy was made up of pollen from various trees; but Prof. Bailey was not able to state, positively, what plants furnished it. Figures of the three forms of pollen granules met with in the powder from Troy, accompany Prof. Bailey's letter. From an examination of these, Mr. Hassall finds that two of them are to be referred to some Endogenous plant, one of them most probably to a species of grass, the other, perhaps, to the genus *Nymphæa*, and that the third form is undoubtedly the pollen of an exogen, not unlikely to be the *Corylus*. Prof. Bailey thinks that no part of the powder can be sporules of *Lycopodium*, because, he remarks, our species of that genus do not flower until July or August, whereas the powder in question fell in May. Hassall arrives at the same conclusion, but for a different reason, the sporules of *Lycopodium* do not present at all the structure of any one of the three figures.—*Ann. Nat. Hist.*, *June*, 1842.

RAPID DECAY OF FRUITS.

ON October 19, was read to the Microscopical Society, a paper, by A. H. Hassall, Esq., entitled "An Explanation of the cause of the Rapid Decay of many Fruits, more especially of those of the apple tribe." The author stated, that on placing a portion of decayed apple under the microscope, he observed vast numbers of ramified filaments passing in all directions between and around the cells of the parenchyma of the fruit; these filaments were regarded as those of a minute fungus, or fungi, which, by insinuating themselves between the cells of the pulp of the fruit, detached them from their connexions with each other, destroyed their vitality, and ultimately produced a decomposition of their contents. The author then gives his reasons for supposing the fungi to be the cause, and not the effect, of the decay; and concludes by describing the several stages of development of the fungi, and their mode of entrance within the fruit.

MICROSCOPIC FUNGUS CALLED ERGOT.

M. **Bonjean de Chambery** states, as the result of numerous experiments,—1, That Ergot gathered the first day of its formation does not possess the deleterious properties that it evinces on the termination of the sixth day. 2, that a heat of 100 degrees Cent. produces the same effects as too early gathering. 3, That fermentation also destroys these principles. 4, That ergot of old rye, not fresh, and damaged, loses nothing in this respect.

NEW GENUS OF PLANTS.

On March 15, was read to the Linnæan Society, a paper on *Edgworthia*, a new genus of plants of the order Myrsinacea, by H. Faulkner, M.D., superintendent of the Hon. East India Company's Botanic Garden at Saharunpore. This genus, of which the only species is *E. buxifolia*, is one of the most characteristic forms of the vegetation of lower Affghanistan. It is found in company with *Dodonæa aioica*, *Olea lactoona*, and an undescribed species of Asclepiadeous plants, a Campelepis. One of the most remarkable points in the structure of *Edgworthia* consists in the style being protruded beyond the flower whilst in bud. This fact was pointed out to the author by Mr. Griffiths.

TUSSACK GRASS.

The splendid Tussack Grass is the gold and glory of the Falkland Islands. Every animal there feeds upon it with avidity, and fattens in a short time. It may be planted and cut like the Guinea grass of the West Indies. The blades are about six feet long, and from 200 to 300 shoots spring from one plant; about four inches of the root eats like the mountain-cabbage: it loves a rank wet peat bog, with the sea spray over it; it is nutritious throughout the year, and all the smaller Falkland Islands are covered with it.—*Guernsey Star, Sept.* 15; *Letter from Capt. Ross' Expedition.*

FRUIT OF THE PONTICUM.

On February 26, the Rev. R. Hussey exhibited to the Ashmolean Society, some preserved Fruit from the neighbourhood of Odessa, supposed to correspond with that mentioned by Herodotus as the produce of that district in his time; cf. Lib. iv. c. 23. Herodotus says, in speaking of the Argippæi, "that they subsist upon the fruit of a tree called Ponticum. It is about the size of a fig-tree, and the fruit as large as a bean, with a hard kernel. When the fruit is ripe, they squeeze the juice through a cloth, and drink it either alone or mixed with milk. It is dark-coloured, and thick, and their name for it is ἄσχυ. The pulp which remains is formed into cakes, which are likewise an article of subsistence." The preserved fruit has much the flavour of the tamarind, without its peculiar sharpness; and the kernel is hard, resembling in substance that of a date. The modern name for it is kizil, and it is used in the present day exactly in the manner which Herodotus describes. Dr. Tritben, who procured the fruit from Odessa, describes the tree as a branching shrub, not unlike a gooseberry-bush; but he was not acquainted with its botanical name.

MUMMY-WHEAT.

On June 10, Prof. Faraday read to the Royal Institution, extracts from a note he had received from Mr. Martin F. Tupper, at Brighton, thus detailing the success of his "resuscitated Mummy-Wheat:"—"A little crop, (the product of some fourteen grains,) is now in full ear and flowering in my garden: the increase is very great, the ears averaging, I should say, seven inches long, and there being, or about to be, from fifteen to twenty ears on each root, springing from one grain: the blades and stalks are uncommonly strong, and altogether, even to unfarmer-like eyes, the crop has an un-English appearance: although, of course, wheat is but wheat, and therefore very like wheat. To unbelievers, as you know, miracles are nothing, and perhaps are impossible; but it is gratifying to find, that our now perfectly restored *triticum* of the third year bears evidence of its exotic nature. * * * * I ought, by the way, to remark, that the soil is common light garden-soil, *un*manured, and that the crop has had no particular care: that which I grew in a hot greenhouse dwindled and spindled away into nothing but aphides; but my careless crop is capital."

The *Bath Chronicle* states that a specimen of Egyptian wheat, from a mummy imported in 1839, is now growing luxuriantly in the garden of the Botanical Society there. The ear is very large, and surrounded by off-shoots. The grain is of the awned kind, and fifteen ears have sprung from one seed. The stalks are very strong, and the plant promises to ripen well.

We have already noticed the growth of specimens of this Wheat by Mr. Tupper, at Albury; and by Mr Long, at Hurts Hall. (See *Year-book of Facts*, 1841, p. 248; 1842, p. 222.)

GROWTH OF COTTON IN INDIA.

Dr. Royle has read to the British Association, an important paper "On the Growth of Cotton in India." Dr. Royle originally believed there were eight species of cotton in India; but he is now of opinion that they might be reduced to four, the others being merely varieties. Two of these are natives of India: one, the common herbaceous cotton, which produces the cotton-wool imported into this country from India; the other, which he calls *Gossypium arboreum*, grows in the hedges in many places, and especially near the houses of fakeers. It is valued on account of the fineness and silkiness of its fibre, and is generally used in the manufacture of head-dresses. The third variety is that usually known as the Brazilian cotton, which differs from all others in bearing its seeds in clusters; and the fourth is the American cotton, originally, he believes, a native of Mexico; from which not only the Upland and Sea-Island cottons of the United States, but the Egyptian, Barbadian, and Bourbon cottons, have all been produced by difference of soil, climate, and cultivation. Dr. Royle at one time doubted whether the black-seeded Sea-Island cotton could be of the same species with the green-seeded Upland; but he has heard such conclusive evidence of the gradual change of the one into the other by cultivation, that he could not entertain any further doubt upon the subject.

Hitherto, the quality of the American cotton has greatly excelled that of India; but Dr. R. thinks it will appear, that the difference has been caused rather by the skilful culture bestowed on the plant in America, than by any inherent superiority in the cotton itself. In America, the cultivation of a cotton-field is conducted on the plan of a garden; that is, attention is paid to each separate plant, and no garden can be more carefully tended. The plants are kept about eight feet asunder; and each carefully hoed, and kept perfectly free from weeds. In India, on the contrary, cotton is subjected to common field-culture; and the plants are not only permitted to grow up together, just as they may happen to spring, but are frequently mixed with other crops, and almost universally choked with weeds. In America, too, great care is exercised in the gathering of the cotton as soon as it is ripe, and before the leaf, growing close under the pod, becomes withered and friable, so as to mix with the cotton. In India, very little care is taken on this head. Until, therefore, an adequate trial has been made of a more careful system of culture and management in India, it is impossible to say what may be the quality of the produce of that country. Dr. Royle then details, at some length, the different experiments which had been made during the last fifty years to introduce new varieties, and an improved system of culture. These, however, have been too much confined to the mere introduction of new varieties, instead of promoting a more careful and scientific mode of cultivation. One fact, at least, has been demonstrated by these experiments, viz., that the exotic species of cotton do not perish or deteriorate in India; for they are growing wild in the neighbourhood of several of the places where they have been cultivated, and in other places the cultivation has been continued by the natives.

Dr. Royle states that he has not the slightest doubt that India would shortly produce an abundant supply of cotton of every quality that can be required, and at a price which will give it a preference in this country. Even if the produce per acre should be smaller than in the United States, it must be recollected that the expenses of cultivation are also much smaller, costing in India only about six or eight rupees per acre, whilst in the United States the expenses amount to at least sixty rupees.

Geology.

THE GLACIAL THEORY.

Mr. Murchison, the distinguished President of the Geological Society, in his address delivered at the Anniversary Meeting, lucidly points out what new materials have been brought forward, abroad and at home, to enable us to reason correctly on the difficult question of the Glacial Theory; and then suggests some essential modifications of the new hypothesis. In conclusion, the President refers to two important documents, the first of which is the discourse of his predecessor, Dr. Buckland, who has so modified his views, as to abandon, to a great extent, the theory of Agassiz, and admit fully the effects of water as well as of ice, to account for many of the long-disputed phenomena. "Whilst this admission involves the concession for which we have been contending, viz., that the great surfaces of our Continent were *immersed*, and not above the waters, when by far the greater number of the phenomena on the surface of rocks were produced," Mr. Murchison rejects for those who entertain the same opinions as himself, the simple division into "glacialists" and "diluvialists," into which Dr. Buckland has divided the combatants on this question; "for to whatever extent the former title has been won by Agassiz and himself, we, who have contended for the submarine action of ice in former times, analogous to that which we believe to be going on at present, can never be merged with those who, under the name of diluvialists, have contended for the rush of mighty waves and waters over Continents."

The other point, and bearing at once on this view, is that—in the *American Journal of Science* for the year 1826, Mr. Lonsdale has detected a short, clear, and modest statement, entitled "Remarks on Boulders, by Peter Dobson," "which though little more than one page in length, contain the essence of the modified glacial theory at which we have arrived after so much debate. First describing in a few lines the manner in which large boulders, weighing from ten cwt. to fifteen tons, were dug out in clay and gravel, when making the foundations for his own cotton factory at Vernon, and seeing that it was not uncommon to find them worn, abraded, and scratched on the lower side, '*as if done*, (to use his own expression,) *by their having been dragged over rocks and gravelly earth in one steady position*,' he adds this most remarkable sentence:—'*I think we cannot account for these appearances, unless we call in the aid of ice as well as water, and that they have been worn by being suspended and carried in ice over rocks and earth under water.*' To shew also that he had read much and thought deeply on the subject, Mr. Dobson quotes British authorities to prove, that as ice-floes constantly carry huge masses of stone, and deposit them at great distances from their original situation, so may they explain the transportation of foreign boulders to our continents. Thus, has American science possessed the original author of the best glacial theory, though his name had escaped notice, and a previous acquaintance with the terse argument of Peter Dobson might have saved volumes of disputation on both sides of the Atlantic."

Prof. Hitchcock, in an address to a meeting of geologists of the United States, observes the phenomena of polished, scratched, and grooved rocks, are more common in the United States than in Europe. If the formation of New England were denuded, 'one-third of the surfaces," he believes, "would be found smoothed and furrowed."

His following remark is important, from its bearing on the Glacial Theory:—"It is very natural to ascribe the smoothness and furrowing of rocks to the action of water. But I have in vain examined the beds of our mountain-torrents, and the shores of the Atlantic, where the rocks have been exposed to the unshielded and everlasting concussion of the breakers, and *can find no attrition that will at all compare with drift*; and I am satisfied that to explain it, we must resort to some other agency." He adds, that the work of Agassiz on glaciers has given us the first glimpse of what seems to be a solution of this problem. He observes that, in the United States, the striæ and furrows have not been found to radiate in different directions from a mountain chain, (as they do in the Alps, which Agassiz calls a "centre of dispersion"), and further, that *the northern slopes of mountains are grooved*, even though very steep, while the drift covers the opposite side. We have here the phenomenon of Crag and Tail, so familiarly known in this country, and under the same aspect, for the marks of attrition here are generally found on the west or north sides of hills. New light has been thrown on this subject by Mr. Murchison's researches in Russia. He thinks that the striated surfaces there cannot be accounted for by the abrasion of glaciers, but may rather be ascribed to *the action of floating masses of ice, armed with stones or gravel adhering to their bottoms*, and that the mounds and ridges of gravel and clay arise from the action of currents casting up on their flanks masses of ice loaded with débris.

Mr. Murchison's hypothesis, if adopted, does not exclude that of Agassiz. On the contrary, it may be assumed, that, while the *glacial condition*, (which caused the great accumulation of ice in the northern regions,) continued, every mountain chain which had then an elevation of two or three thousand feet above the sea would be encrusted with ice, perhaps as far south as the latitude of 40°. Each of these would be, on a small, what the polar nucleus of ice was on a great scale—"a centre of dispersion." Grooving clearly referable to glacial action has been traced on Jura and the Vosges, and the author believes also on the Scandinavian chain as well as the Alps.

Mr. Lyell has shown that in the present state of our knowledge, the distribution of erratic blocks cannot be explained, without assuming the agency of floating masses of ice in transporting some of them. We have a good example at hand in the Pentland Hills, where a block of mica-slate, which must have travelled from the Grampians, may be seen resting on the soil near the Waterfall at Habbie's How. It weighs 8 or 10 tons, and occupies a position about 1,100 feet above the sea. No glacier, by the mere expansion of its mass, could carry this across 50 or 60 miles of low country, and lodge it where it lies. —*C. Maclaren, Esq., F.R.S.E., Jameson's Journal*, No. 63, *abd.*

In a paper by Sir George Mackenzie, read to the Royal Society of Edinburgh, on March 7, the author directs attention to "the most recent Disturbance of the Crust of the Earth, in respect to its suggesting an Hypothesis to account for the Origin of Glaciers." After glancing at the influence of internal heat as the cause of the most recent disturbance, he assumes, as the groundwork of his hypothesis, that there existed between the crust of the earth and the hot fluid below, a vast amount of elastic matter, greatly compressed, and in a highly heated state. Now, let us suppose the expansive force to have, at length, overcome the resistance of the solid crust, to have broken it up, and to have elevated the Alps, as we see them, to heights beyond the line of perpetual congelation. Sir George assumes this to be a catastrophe sufficiently sudden to have enveloped living creatures in a material which would preserve their bodies for ages, if floated to the Arctic Regions, or leave their remains in a colder region now than it was when they lived. Thus may the valley of the Rhone have been filled with ice, boulders transported from the Alps to the Jura, and centres of dispersion have been formed. We may find also the origin of the older diluvium, while preparation was made for subsequent floods that have left various and, in some instances, apparently anomalous traces, behind them. Agassiz may also be furnished with means to support his original inference, with this only variation, that he supposed the ice to have been formed before the mountains, while Sir George Mackenzie has supposed them first raised, and then covered with ice. The entire paper will be found in *Jameson's Journal*, No. 65, wherein, also, is a valuable paper "On some Geological and Physical Considerations connected with the Glacier Theory," by Prof. H. G. Bronn, of Heidelberg.

The same Number also contains a *precis* of M. Charpentier's *Essay on Glaciers*, in which his theory is thus compared with that of M. Agassiz. "Ice, it is true, is the principal agent in both hypotheses, but the one supposes a very considerable change in the temperature, and a state of things which nothing of our own times can enable us to form an idea of, while the other is founded on the direct observation of actual facts, and requires nothing more from the imagination of the reader, than to prolong, for a sufficient time, the exceptional circumstances, of which we yet witness occasional instances. This theory of diluvial glaciers has already made much progress among geologists, and its application is by no means limited to the erratic deposits of the Alps. At a great number of places in England, Scotland, and Norway, some have thought they recognised facts analogous to those on which M. de Charpentier has founded his hypothesis, and, now that the impulse is given, it is perhaps more to be feared that we shall see a good many geological phenomena ascribed to the influence of glaciers, which the author of the theory would himself have excluded, than that doubts will be thrown upon the facts which he has so well described and conscientiously observed."—*Biblioth. Universelle de Genève.*

No. 65 of *Jameson's Journal* likewise contains a valuable summary of the Geological Structure of the Alps, which is taken from the *Bibliothèque Universelle de Genève ;* and owes its origin to a lecture given by M. Studer, of Berne, to the party of naturalists assembled in the summer of 1841, at the Hospice of the Grimsel.

ON May 30, a letter was received by the Academy of Sciences, at Paris, from M. Agassiz, stating that he was on the eve of departure for a new sojourn on the Alps, where he proposed to remain at least for the months of July and August. He was to establish himself again on the glacier of Aar. The special point which he proposed to investigate was, the dilatation of the ice consequent upon infiltration ; and upon the freezing of the water in the fissures and channels of the glacier, which is considered to be the essential cause of its progressive motion. There had been data already collected as to the quantity of water a glacier imbibes, even to the depth of 110 feet. This year he hoped to have the means of penetrating to 1000 feet; and thus to traverse the whole mass to the greatest thickness yet known, and to determine the quantity of water which circulates in the interior of a glacier. Before precise data on this point be obtained, it is impossible to advance a step in the inquiry. As to the fact of the dilatation, M. Agassiz has already shown it ; but rigorous observations are not as yet sufficiently numerous for conclusive proofs, and these he wished to supply during the year. The manner in which two glaciers, confluent, adhere, he is desirous to ascertain ; and he expects to determine this by the removal of the moraines which cover them. He is likewise desirous to ascertain whether the lamellar structure of the glacier will be as distinct this year as last. To decide to what depth this structure obtains, he proposed digging a gallery into the side of the glacier as far as possible. In concluding his letter, M. Agassiz offered to collect air from heights, if M. Dumas would send him balloons. Thus might be obtained air from a height of 11,000 feet.

ON August 29, a further communication was read from M. Agassiz, stating that he had ascertained the glacier to be throughout mined and sapped by watercourses ; that ice is porous in a high degree, and that the motion of glaciers is due in part to the infiltrations of water through the mass, thus undermining the base ; and that the experiments on the glacier of the Aar have established the truth of this theory. M. Agassiz also records a fact which tends to corroborate what has been stated as to the phosphorescence of clouds. He mentions that it is more easy, on the glaciers at night, to distinguish the hands of a watch when the sky is covered with clouds, than when it is cloudless, and the light of the stars is seen. He also states that the

appearance of a peculiar snow, well known to all visitors of the glaciers, is not a snow that falls, but merely a modification of the frozen surface.

CHEMICAL GEOLOGY.

PROF. JOHNSTON has read to the British Association, a brief summary of the second part of his "Report on Chemical Geology."* In this communication, which was confined to the igneous rocks, there were three principal points to which the author wished to direct attention: the nature and chemical composition of these rocks, their immediate source, and the effects they produced upon other rocks. He stated that all geologists were now agreed that these rocks had been originally in a state of fusion, and protruded from the earth in a liquid form. This had taken place in several different ways: sometimes they appeared as if forced up through the stratified rocks, and remaining amongst them at various angles; at other times they overlay the stratified rocks, or were found alternating with them. He then pointed out different modes in which the igneous rocks affected the beds with which they were associated; and stated that he agreed with Mr. Lyell in considering, that where two beds are differently affected by such contact, it was owing to differences in their chemical construction. The phenomena of volcanic eruptions he attributed to the chemical action of certain substances existing in the interior of the earth, either amongst themselves or by coming in contact with water.

Sir H. de la Beche stated, that in the Silurian region there was decided evidence of eruptions corresponding to the volcanic action of the present day; there were beds of volcanic ash of the same chemical composition as trap, and, when consolidated, undistinguishable from greenstone, but containing organic remains; and these deposits occurred in the series mingled with solid igneous rocks, and were evidently the result of the same general cause. He, therefore, contended that modern volcanic action, as it was termed, was not confined to recent periods. Dr. Buckland was gratified to observe the steady advancement of the opinions founded by Hutton; and remarked, as an act of justice, that Dr. M'Culloch was the first to entertain those views as to the origin of gneiss, mica slate, &c., which regarded them as rocks altered more or less by heat, up to the extreme amount of alteration nearest fusion.—*Athenæum*, No. 770.

SUBTERRANEAN RESERVOIR OF THE CHALK BASIN OF LONDON.

ON May 31, was read to the Institution of Civil Engineers, a paper by the Rev. Mr. Clutterbuck, "On the Periodical Drainage and Replenishment of the Subterranean Reservoir of the Chalk Basin of London." The line of the country more particularly treated of, is that through which the river Colne passes: part of this district is covered with gravel, through which the rain-water percolates to the chalk, in which it accumulates, until it rises and finds vent by the streams Ver, Gade, Balbourne, and Chess, which are tributaries of the river Colne; the other portion of the district is covered by the London and plastic clays, on the surface of which the rain flows by open drains, into the Colne, rendering it subject to sudden floods. In the upper or chalk portion of the district, a periodical exhaustion and replenishment of the subterranean reservoir is continually going on, which has been traced by the author through a series of wells, and found to be exactly in proportion to the distance from the river or vent: a progressive rise takes place between autumn and spring, and a fall between spring and autumn. The sources of several streams have been found to break out higher up, as the water accumulates in the chalk reservoir above a certain level; they seldom run for a long period, as the increased drainage they afford soon depresses the level. The paper treated at some length on the depression of the water-level beneath London, from which it would appear that the rapidity of the demand exceeded that of the supply. It then stated the depression of the London wells to be, during the week, about five inches. On Sunday, during the cessation of pumping, the original level is generally nearly resumed. Heavy falls of rain, or extraordinary cessations of pumping, vary this alternation of level; but, as a general rule, the author assumed that the holidays of the metropolis ought to be known by the relative heights of water in the wells at some distance from it.

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* See the first part, in Year-Book of Facts, 1841, p. 160.

ANALYSIS OF THE BRIGHTON CHALK.

Dr. E. G. Schweitzer was anxious to ascertain if the chalk of the Brighton Cliffs contains any ingredient peculiarly favourable to the growth of *gramineæ*, in consequence of the well-known fact, that the herbage of the South Downs, along the coast of Sussex, affords a superior food for cattle, producing meat of excellent quality, for which these downs are justly celebrated. The Doctor, accordingly, analysed the chalk, and the result substantiates the presence of phosphate of lime, an ingredient valuable for the nutrition of plants.

The discovery by Professor Ehrenberg, that the Brighton chalk consists of microscopic shells, is a decided proof of its animal origin; to which may now be added an additional one, viz., the presence of phosphate of lime, which is a usual, though secondary, ingredient of the shells of crustacea.

SNAIL-HOLES IN LIMESTONE.

Dr. Buckland has exhibited to the British Association, a slab of Limestone from Plymouth, perforated with deep, round holes, which he attributed to the long-continued action of the slime of garden Snails, (*Helix aspersa*); and stated that he found litmus paper to exhibit a slight red tint if these snails are made to crawl over it. The feeble action of a small quantity of acid in their slime continued on the same parts of the same stone during a long series of years, seems to afford an adequate cause for these effects, which were adduced at Plymouth as the work of marine animals, and affording evidence of a raised beach. On visiting the spot, Dr. Buckland found the slab now exhibited, with several living snails, and shells of dead snails in the holes. In September 1841, he found similar holes, with shells of a smaller wood snail, (*Helix nemoralis*,) in them, on the under surface of slabs of limestone in Cumberland, and Mr. Baker has recently observed them in the limestone of Cannington Park, near Bridgewater.

AMBER.

A RICH mine of Yellow Amber, of a hardness equal to rock-crystal, has been discovered in the neighbourhood of the town of Zehderick, near Potsdam. This discovery is the more remarkable, as, up to the present time, yellow amber had only been found in the Baltic, or on the shores of that sea.—*Galignani's Messenger, October*.

NATIVE GOLD.

THE Russian *Commercial Gazette* states, that a lump of Native Gold, of the enormous weight of 2 poods and 7lb. (about 95lb. English), was found, on the 7th of December, in the sands of Miass, near the mines of Zlatooust, and placed in the museum of the Institute of Mines, at St. Petersburgh.—*Globe*.

REMARKABLE SHELL.

ON May 4, Lieut. R. Reed exhibited to the Linnæan Society, a large Shell, brought from Raiata, in the Society Islands. This shell was remarkable for having retained, for several years, between its layers a considerable quantity of water, which, on being exposed to the cold during the last winter, became frozen, expanded, broke the shell, and thus escaped.

ORIGIN OF COAL.

MR. WILLIAMSON has read to the British Association, a paper "On the Origin of Coal," in which he has collected all the principal facts and phenomena bearing upon the origin and formation of coal, with the view of proving it to have originated in the drifting of vegetable matter into the sea, and not by the accumulated growth on the same spot now occupied by the coal.

Mr. Binney has also read to the Association, a practical description of the Lancashire Coal-field, a paper not only of great local, but great general interest; the facts and opinions of which would, however, occupy too much space for our pages.

MICROSCOPIC STRUCTURE OF COAL.

PROF. PHILLIPS has read to the British Association, a paper "On the Microscopic Structure of Coal." He first observed that there was now no difference of opinion as to the vegetable origin of coal, but only as regarded the circumstances under which those vegetable masses were accumulated. In the microscopic examination of polished slices of coal, by means of transmitted light, some results had been obtained by Mr. Hutton, of Newcastle, who, he believed, had detected a cellular structure in the substance of the Northumberland coal, which at first sight might be imagined vegetable cells. These cells had been supposed to contain much, if not all, the gas of the coal; and in this respect the Northumberland coal differed from the anthracitic, in which the cells were empty. Having lately observed something remarkable in the combustion of Staffordshire coal, he was induced to examine it microscopically. He observed that the ashes of wood and peat differed in appearance and structure; and this Staffordshire coal, which did not cake, but burned to a white ash, resembled in its combustion the laminated peat of the north of England, or the compact black peat of Dartmoor. Upon examining these ashes, he found abundant traces of vegetable structure, consisting of small portions of woody tissue imbedded in other tissue, apparently of plants much lower in their organization. He had also detected traces of structure in the ashes of anthracitic coal received from Sir H De la Beche. Mr. Phillips considered this evidence rather in favour of the view that coal was in a great measure formed by plants growing on the spot, and not by drifting —*Athenæum*, No. 768.

REMARKABLE ICEBERG.

On the passage out in the *Acadia*, from Liverpool to New York, Capt. A. Ryrie reports that, on the 16th of May, in lat 46°, long. 47°, there were seen about 100 icebergs, some of them of large size, and one from 400 to 500 feet high, bearing so strong a resemblance to St. Paul's, that it was at once christened after that celebrated cathedral. The dome was perfect, and it required no extraordinary stretch of imagination to supply the turrets, pinnacles, and other parts of the building On the homeward passage of the *Acadia*, to Liverpool, on June 6, the same iceberg was seen, but, in the interim between the two views, it had drifted about 70 miles —*Times*.

THE DERWENTWATER FLOATING-ISLAND.

This phenomenon, which has risen to the surface of the lake at Derwentwater twelve times in the last forty years, re appeared early in September in two places, at about 40 yards apart.—*Carlisle Patriot.*

ERUPTION OF MOUNT ETNA.

A letter from Catania, dated December 11, thus details the very recent eruption of Mount Etna “As long ago as the 17th ult., the summit of Mount Etna exhibited extraordinary symptoms. The smoke, which usually covers it and the crater, became blacker and more dense, and seemed to be thrown out with much greater force than usual, but as there had been some rainy days and indifferent weather, and as similar phenomena occur at changes of temperature, little attention was paid to the existing appearances. Besides, the fog with which the atmosphere was loaded, and the almost constant rain, prevented any distinct observation of the mountain. It was not until the 26th of November that a subterraneous noise was heard, which left no longer any doubt that serious commotions were going on in the interior. Towards night, we observed at intervals, when the atmosphere was a little clear, that immense columns of smoke and showers of ashes and stones were thrown up with great force. The darkness, too, rendered apparent the flames which rose at intervals, always accompanied by thick smoke, mingled with ashes and stones in a fiery state As the wind was N E on the 27th, and the vapours very thick, we could not perceive what was passing on the mountain, but towards night we had better weather, and saw immense volumes of flames, always accompanied by ashes and stones, which fell red-hot The eruptions issued alternately from three different craters It was impossible not to be struck with the grandeur of the spectacle, when masses of flame surrounded all the craters, and seemed to flow through the gorges of the mountain About one o'clock in the morning, the great basin of the crater was full of burning lava, which overflowed and ran down the south side in a torrent of liquid fire, to the place called the English House, and there mixed with the lava of 1787

"On the 28th, the commotions of the mountain, and the frequent showers of ashes and stones mingled with flame, diminished, but in the evening, these threatening appearances returned with increased force The lava, which had ceased to flow toward the south, was now divided into two torrents towards the north-east, and it rushed down in the direction of the valley of Bronte, spreading destruction through the beautiful forest which adorns the declivity of the mountain on that side On the night of the 30th, a new and wonderful spectacle was presented to our eyes by the centre of the crater, which was at the moment throwing out flames with less violence We observed therein a new cone of burning matter, which crumbled into pieces by the action of the fire in the crater at the same time, clouds of burning matter were thrown out, followed by rushing flames, which seemed to set the heavens on fire"—*Abridged from the Times*

By a letter from Palermo, dated December 12, we learn that shocks were felt at Aquila, on December 5, that on the 6th the flow of lava extended 10 miles, and that the eruptions had been prolonged beyond the period at which the most experienced persons expected them to cease

VOLCANOES IN SOUTH AUSTRALIA

MOUNT GAMBIER and Mount Schank between the western bank of the Glenelg and Rivoli Bay, are found to be extinct volcanoes, Mount Schank having five craters, each of which is filled with pure fresh water, and about three quarters of a mile in diameter, with perpendicular cliffs, at the height of about 200 feet from the water's edge

UPHEAVINGS IN BRAZIL

M PISSIS has addressed to the Academy of Sciences, at Paris, a memoir on the geological position of the soil of the southern part of Brazil, and the Upheavings which at different epochs have changed the outline of the country This work is the result of five years' survey, and is divided into two parts the first is devoted to the examination of the composition of the strata, the second comprises the change of their position and direction. The country explored by M Pissis is situated between the twelfth and twenty-seventh degrees of south latitude, and embraces the space contained between Parana, the St Francis, and the sea.

EARTHQUAKES IN 1841

St Domingo.—On May 7, at 5 o'clock in the evening, a terrific Earthquake occurred in the Island of St Domingo. It appears that the principal destruction of life was at Cape Haytien, which town was entirely destroyed. It contained 15,000 inhabitants, and two-thirds of them are stated to be dead. The approach of the earthquake was indicated in Port-au-Prince by great heat, and heavy clouds that covered the neighbouring hills, and followed the direction of the south-west to the north-east. The vessels at anchor, some of the sailors report, experienced the shock before they saw the houses agitated, which seemed to indicate that the shock came from the west. The accounts state that "the first shock lasted from two to three minutes, if not longer, and occasioned great damage to numerous buildings, particularly those occupied by foreign commerce. We have since had repeated shocks, of short duration. The town is a picture of consternation, and will remain so until after Pentecost, the anniversary of the terrible convulsion of 1770. Our stores and dwelling-houses are shattered from roof to base." On May 9, at 12 o'clock there was another shock. The weather all the while was changeable: now extreme heat, now rain, now fair, and now signs as if of a storm. Next day, there was another shock, and subsequently, "it seemed to us that we walked upon a quaking earth." Accounts from Gonaives of the 8th are more deplorable. The greater part of the houses were overthrown. A fire broke out at the same time, destroying among other buildings the powder magazine, and there was not a drop of water in the town. All the houses that were not burnt suffered from the earthquake.

On the same day, (the 7th of May), but about two hours earlier, that is to say, at three o'clock in the afternoon, the shock of an earthquake was felt at Louisiana; it lasted two or three seconds, and gave rise to a commotion which caused the waters of the lake at Catahoula to rise, during the space of two minutes, to more than six feet.

Captain York, of the schooner *Independence*, at New York, states that on the 7th the shock of an earthquake was felt at Ponce. The houses rocked, and so great was the motion of the earth that casks of sugar and molasses rolled about, making sad havoc. The shock was felt at three, P.M., and lasted about three minutes.

Captain Brown, of the *Isaac Franklin*, states that there was a violent shock of an earthquake at Mayaguez, P.R., on the 7th of May, at four P.M. He was on shore at the time, and did not see or hear anything until he observed the land having the motion of the sea, rocking to and fro.

A letter from Captain Franklin, of the West-India steamer *Tweed*, states, that while at least in three hundred fathoms water, the shock was felt as if the vessel had run aground. The distance from the land was twelve or fourteen miles. How great must have been the convulsion!

The *New York Herald* of the 30th May, gives the following summary:—"The earthquake which has recently desolated a large portion of St, Domingo, was one of the most severe that has occurred in any part of the world for many years, and perhaps more extensive in the sphere of its operations than any since the earthquake which destroyed Lisbon in 1755. It appears that on the same day, and very nearly the same hour, the effects of this recent earthquake were felt at various places ranging from Port-au-Prince to the base of the Rocky Mountains. The greatest explosion was felt at Cape Haytien, on the 7th instant; here they had three successive and violent shocks; and previous to the first of them a shock of the earthquake was felt at Porto Rico on the morning of the 7th of May, which, as far as we have yet learned, was the most easterly point at which the effects of it were felt. The shock, it seems, then took a north-westerly direction, and ultimately tore the ground asunder, and broke out at Cape Haytien. It stretched clear across the breadth of St. Domingo, and was felt at Port-au-Prince on the same day and nearly at the same hour. It also travelled on, and was felt at Mayaguex at the same time; then to St. Martinville, and one or two other places in Louisiana; thence to Van Buren, Arkansas, and clear up to the foot of the Rocky Mountains, where it was also felt on the same day. It thus travelled at least 1,500 miles, and perhaps was felt even further."

Greece.—An Earthquake, of more than usual extent and violence, occurred on the 18th April. Beyond the Eurotas an immense rock fell from Mount Menelas, near the village of Drouchas. An old tower, situated in the town of Magoules, was thrown to the ground. At Mistra, the soil trembled with violence, and a portion of the Hellenic College and several houses were destroyed. The water of the springs and wells became turbid; and an enormous rock, having detached itself from the summit of old Mount Mistra, rolled with terrific noise into the town. Upwards of fifty dwellings were thrown down at Areopolis, and fifteen towers crumbled at Œtylus. Many persons were buried under the ruins of their houses in the province of Maina. At Androusa, several churches fell in.

Cornwall.—A Report has been drawn up by Mr. Hunt, for the Polytechnic Society, of the particulars of the Earthquake felt in Cornwall, on the 17th of February last; from which we collect the following details:—"In the neighbourhood of Falmouth the noise attracted attention, although but few persons felt any tremulous motion. At Penryn the disturbance was more decidedly felt; doors were shaken, and the earthenware rattled on the shelves. At Roosanooth, and down the valley, the shock was considerable, and the first impression was that the powder-mills in the neighbourhood had exploded. The inhabitants of the villages of Comfort and Lammer, about the junctions of the granite and killas, or clay slate, left their houses, thinking that some serious explosion had taken place at the neighbouring mine. At Cann Marth, a terrified widow ran out shrieking that the side of her house was falling in. In Poldory, the shock was felt by the men working 130 fathoms below the surface. In other places, it was felt even more intensely; and at Constantine doors flew open, persons were shaken in their beds, and some men working in the house ran out to ascertain the cause. At Helstone, the disturbance was considerable. At West Weal mine, men at work in the 100 fathom level felt a shock, and as it were a rush of air, so much so that one of the candles was put out by it, accompanied by a noise which made them think that one of the shafts had crushed in. This appears to have been the most westerly part at which the tremor was felt; although the noise was heard further, but in diminished force. Mr. Hunt states that, on referring to a geological map of the county, it will be found that the greatest effects were produced near the edge of the granite mass, which extends from the north-east to the south-west, Cann Marth to the South of Penryn. Although it was felt at Falmouth, Helstone, and other places which are on the clay slate, yet all his inquiries went to show that it diminished rapidly in force as the distance from the granite increased."

Perthshire.—The following is the "Report of the Committee appointed at the Meeting of the British Association, held in Plymouth in 1841, for Registering Shocks of Earthquakes in Great Britain."

The Report commences with a list of shocks observed at Comrie, in Perthshire, since the date of that given in, last year, to the Association, by the Committee. Sixty distinct shocks are recorded as having occurred on thirty-six different days, between July 23rd, 1841, and June 8th, 1842. Twelve of these are registered as having occurred on the 30th of July, 1841, being the greatest number hitherto noticed in the course of a single day.

1. On the 26th of July, 1841, the inverted pendulum set in the steeple of Comrie parish church, was thrown about half an inch to the west, apparently indicating a horizontal movement of the ground eastward, to the same amount. An *upward* heave of the ground, to the extent of half an inch, was also indicated by two instruments, one of them being a horizontal bar, described in the course of the Report

2. The next shock by which the instruments were affected occurred on the 30th of July, 1841. The inverted pendulum in Mr. Macfarlane's house at Comrie, vibrated to the extent of half an inch, in a direction south and north; whilst at Tomperan, (about 1½ mile east of Comrie), an instrument on the principle of the common pendulum vibrated east and west. The instruments for shewing vertical movements were but slightly affected. Mr. Macfarlane describes this shock as very severe, though not so violent as that of October, 1839 estimating the former at 10, the intensity of this shock may be represented by 8. The shock was distinctly *double*, and the noise and vibrations accompanying it are described as very loud and violent, both as observed within houses and in the open air. Twelve shocks are said to have been felt in the course of the day, the weather was cold and inclined to stormy, at the time of this occurrence, and for a day or two before and after. The trees in the neighbourhood of Comrie are described as much agitated. The shock was felt eastward at least as far as Newburg, about 38 miles from Garrichrow; westward to Dalmally, about the same distance, as far north as Glenlion, 30 miles; and southward to Alloa and Sterling, 20 or 30 miles. All the shattered chimneys noticed near Duniva were on walls, &c. running N. and S., those on E. and W. walls being untouched The injured buildings stood on a gravelly soil; but the distance from rocks below was unknown. There was nothing in the weather, previous to the earthquake, to give any

notice of its approach; indeed, after a course of some years' observation, no exact rule in this respect has been obtained; even a period of wet weather, which was formerly thought the constant forerunner of frequent and violent shocks, is not always succeeded by them; and, on the other hand, earthquakes have occurred when the sky was clear and open. The spot from which the earthquake shocks in Perthshire appear to originate, being situated about a mile to the north of Duniva, it is not difficult to understand why walls running N. and S. were affected, and those from E. to W. untouched.

3. On the 9th of Sept., 1841, another pretty severe shock was felt at Comrie, about 10 before midnight. The following morning the Association's instrument in the steeple was inclined ⅜ of an inch to the south; that in the Comrie House ⅛ an inch to the north. This disagreement in the indications may, perhaps, be accounted for by the occurrence of two other shocks in the course of the night, and previously to the examination of the instruments. The weather during the two preceding days was remarkably wet and close.

4. On the 8th June, of the present year, two shocks were felt at Comrie, between 1 and 2, A. M. The horizontal pendulum recently sent to Mr. Macfarlane's house, indicated an upheave of the ground to the extent of a quarter of an inch. From a review of all the details, it seems probable that the particular spot from which the earthquakes emanate is situated about one mile N. E. of Duniva House, and one and a half or two miles N. W. of Comrie; and it is considered desirable to place additional instruments at Duniva, and in the neighbourhood, with the view of approximating still nearer to the exact spot of emanation.

The additional instruments for indicating earthquake shocks, lately sent out, are seven in number. 1. Four of these are on the principle of the watchmaker's noddy, explained in the last year's Report.—2. Another instrument consists of four horizontal glass tubes slightly turned up at each end, and filled with mercury. These tubes are laid down on the solid floor of a room, according to the points of the compass; and it is expected that when a shock takes place, the mercury will flow out of one or more of these tubes. If there be no horizontal movement, but an inclination of the ground only, the mercury will flow out of the tube or tubes affected by the inclination. This instrument was made by Mr. Newman, of London, under the directions of Professor Wheatstone and Mr. D. Milne.—3. The two remaining instruments are intended exclusively to indicate vertical movements of the ground. They consist of a horizontal bar fixed to a solid wall, by means of a strong flat watch spring, and are loaded at the opposite end. If the wall suddenly rise or sink, the loaded end of this horizontal rod remains from its *vis inertiæ* nearly at rest, and thus can move any light substance, (as paper or a straw,) brought against it by the vertical movement of the ground; the light substance being so adjusted as to remain fixed wherever the rod moves it.

Beside the above instruments, a barometer, a double thermometer, and a rain gauge, have been sent to Mr. Macfarlane at Comrie, in order that the state of the atmosphere at the time of the shocks, and the nature of the weather generally, during their occurrence, may be ascertained.

To this may be appended the following record of another shock at Comrie, subsequent to the latest date in the above Report:—

On Sept. 24, two rather smart shocks of Earthquake were felt at Comrie, one in the morning, at 5 min. to 6, and the other at 1 min. to 7 in the evening. In the usual scale, the former is registered at three for shake, and four for sound; and the latter as two for tremor, and three for sound. By the first, the inverted pendulum in the steeple was moved to the N. W. ⅛ inch, the horizontal pendulum about $\frac{1}{10}$ of an inch, and the spring pendulum ranged about ⅛ and depth $\frac{1}{16}$. In the second shock, none of these seismometers were sensibly affected: but the sandglass (one of which happened to be set for the first shock,) sunk on the latter occasion fully $\frac{1}{10}$ inch—which is almost the same effect that a heavy carriage passing the house where it was placed has upon it: a very delicate spring-pendulum attached to this instrument vibrated E. and W. $\frac{1}{8}$ inch, with no perceptible dip. The barometer and thermometer, which were strictly watched, seemed neither of them to be in the least affected. The former stood at 29·528 inches, and the latter at 55·10 for more than three-quarters of an hour after the last shock.—*Stirling Observer.*

Pitlochry.—Between 7 and 9 o'clock, in the evening of August 19, three shocks of an earthquake were felt at Pitlochry. The first produced so much noise and tremor, that travellers looked in the expectation of seeing carriages behind them. The second shock was fainter; but the third was fully as powerful as the first. The night was warm and sultry, with drizzling rain, and the day had been very warm and rather cloudy. The thermometer at midnight on the 18th was at 72°. Each shock continued only a few seconds, but the third was the longest.—*Scotch Paper.*

BRITISH FOSSIL MAMMALIA.

PROF. OWEN has read to the British Association, the first part of his Report on Fossil Mammalia, including the Quadrumana, Cheiroptera, Insectivora, Carnivora, Rodentia, Marsupialia, and Cetacea of Great Britain. This enunciation alone made known, the Professor remarked, the surprising fact, that one order of mammalia, the Marsupial, had now totally disappeared from the Old World; and a second order, recognised as European only, by the few monkeys which breed on the rock of Gibraltar, had formerly representatives in the land now constituting the British Islands. The existence of a species of Macacus has been determined by Prof. Owen, from fossil teeth and fragments of jaw discovered in a stratum of the Eocene tertiary period, at Kyson, near Woodbridge, Suffolk. The anatomical characters and comparisons by which this very remarkable fact was established were given in detail. The evidence was stated to be as complete as that which had proved the existence of another quadrumanous species, a long-armed ape, in a contemporary formation in the south of France.

The most generally interesting and remarkable fossils described in the present part of the Report, were those of the large carnivorous quadrupeds; as the bear, tiger, leopard, and hyena. With respect to the genus Ursus, Prof. Owen commented on the difference which England presented, as compared with continental Europe, in the number of fossil bones of bears in diluvial caverns and drift. These, which are so abundant on the Continent, are very rare in England, where, on the other hand, the remains of the hyena predominate, which are very rare fossils in the German bone caves. He thought it worthy of consideration how far this difference in the geographical distribution of the two genera, at the anti-diluvial, or anti-glacial, epoch indicated the insular separation of Great Britain at that period. The richest depository of bears' bones at present known in England is the cave called Kent's Hole, near Torquay. The oldest depository of ursine fossils in England was stated to be the tertiary red craig, below the so-called mammaliferous crag, the locality named was Woodbridge

After enumerating the several caverns and other localities, in which the remains of a large species of the hyena have been found, Prof Owen next entered upon the question of its character and affinities to the known existing species The ancient British cave hyena more closely resembles the *Hyæna crocuta* of South Africa than the *Hyæna vulgaris* of North Africa and Asia Minor The numbers of the *Hyæna spelæa* in England may be conceived, when the remains of not fewer than from 200 to 300 have been discovered in a single cavern, as that at Kirkby Moorside Fossil hyenas have been shown by Dr Buckland to be found in this country, as on the Continent, in situations of two kinds, viz, caverns and drift, or the so-called diluvial gravel In the latter formation, they were first discovered in England in the year 1822, at Lawford, near Rugby, associated with the bones of the mammoth, rhinoceros equus, bos, &c

The remains of a feline animal surpassing in size the largest lion or tiger, have been found in the bone caves of Mendip Hills and those of Oreston, at Kirkby Moorside, and in Kent's Hole Of this remarkable species, to which the name of *Felis spelæa* has been given most of the characteristic bones have been discovered in the caves of Gailenreuth, proving its true feline structure

Order Cetacea most of the remains of this order of mammalia have been in Great Britain found in gravel beds adjacent to estuaries, or large rivers in marine drift or diluvium, and in the subjacent clay beds, but although these depositories are the most superficial, and belong to the most recent period in geology, the situation of the cetaceous fossils generally indicates a gain of dry land from the sea Thus, the skeleton of a balænoptera, seventy two feet in length, found imbedded in clay on the banks of the Forth, was more than twenty feet above the reach of the highest tide Several bones of a whale, discovered at Dunure Rock Stirlingshire, in brick earth, were nearly forty feet above the present level of the sea The vertebræ of a whale, discovered by Mr Richardson in the yellow marl, or brick earth, of Herne Bay, in Kent, were situated ten feet above the occasional reach of the sea on that coast A large vertebra of *Balæna mysticetus* was discovered fifteen feet below the surface, in gravel, by the workmen employed in digging the foundation for the new Temple Church The tooth of a cachalot has been discovered by Mr Brown, in the diluvium of Essex Many analogous localities were cited, from which cetaceous remains had been obtained of the genera Balæna, Balænoptera, Physeter, Delphinus, Monodon, and Phocæna

Order Marsupialia In the eocene sand, underlying the London clay, at Kyson, near Woodbridge, Sussex, a small portion of jaw, with a spurious molar tooth, was found This had been referred to the opossum, (Didelphys), but Prof Owen, to whom the specimen had been submitted by Mr Lyell, considered that the evidence it afforded was insufficient to establish the conclusion, although the resemblance was sufficiently close to render its accuracy probable. Additional specimens were required to demonstrate the existence of a Didelphys in British eocene formations, as satisfactorily as had been done by Cuvier in regard to the small opossum from the contemporary strata in France.

In conclusion, Prof. Owen dwelt on the interesting correspondence between other organic remains of the British oolite, and existing forms now confined to the Australian continent and neighbouring seas. There the Cestracion swims, which has given the key to the nature of the "palates" from the oolite, now known as teeth of congeneric gigantic forms of cartilaginous fishes, (Acrodus, Psammodus, &c.) Living Trigoniæ and Terebratulæ abound in the Australian seas, and afford food to the Cestracion, as their extinct analogues, probably, did to the Acrodi, &c. Araucariæ and cycadeous plants flourish on the Australian continent where marsupial quadrupeds abound, and thus appear to complete a picture of an ancient condition of the earth's surface which has been superseded in our hemisphere by other strata, and a higher type of mammiferous organization.

The second and concluding part of the Report on British Fossil Mammalia, it was stated, would contain an account of the fossil herbivorous or ungulate species of mammalia, many of which constituted the prey of the lions, bears, hyænas, wolves, &c., which co-existed in Great Britain with the gigantic deer and oxen, rhinoceroses, hippopotamuses, elephants, and, still stranger pachyderms, in the antediluvial and tertiary periods.—*Athenæum Report.*

THE FOSSILS SIGILLARIA AND STIGMARIA

At the meeting of the Natural History Society of Northumberland, &c., Mr. W. King read the first part of a paper, entitled "Contributions towards establishing the general characters and affinities of the vegetable fossils *Sigillaria* and *Stigmaria*." To the collection of the museum had been added, within the previous year, several highly interesting specimens of these remarkable fossils, which, together with a memoir, written by M. Adolphe Brongniart, "On the internal structure of *Sigillaria elegans*," supplied Mr. King with the materials for his paper. The memoir of Brongniart, which is one of the most important additions to the botanical literature of the present day, has been epitomized by Mr. King, and forms that portion of his paper which was read at the meeting. The concluding part, in addition to treating on several important points connected with other vegetable remains of the same geological age, will, in the opinion of the author, completely prove that *Stigmaria*, which has hitherto been considered a distinct plant, is nothing more than the root of *Sigillaria*.

As it is intended to publish the memoir, palæontologists may therefore expect shortly to become acquainted with the various evidences with which Mr. King is enabled to support his position.—*Literary Gazette*, No. 1327.

FOSSIL-FISHES IN THE DEVONIAN SANDSTONE

M. AGASSIZ has addressed to the British Association, a letter "On the Fossil Fishes in the Devonian or Old Red Sandstone Formation," which we notice chiefly for the new grand theory which the writer has built up on this subject. M. Agassiz holds, that organic beings were entirely destroyed at every *étage* in the formation of the crust of our earth, and an altogether different creation adapted to the altered system of the world. This has startled his compeers, and given rise to as strong a sensation as his Glacier Theory did; but the conclusion was at once repudiated by many of the most eminent geologists in Manchester.

The genera particularised by M. Agassiz, which have the greatest number of species are the *Pterichthys*, *Cocosteus*, *Cephalaspis*, *Opeolepis*, *Dipterus*, *Glyptolepis*, *Platygnathus*, *Dendrodus*, *Diplacanthus*, *Cheiracanthus*, and *Cheirolepis*. Among those which have representatives in the silurian system, or coal measures, are *Onchus*, *Etenacanthus*, *Etenoptychius*, *Ptychacanthus*, *Acanthodes*, *Diplopterus* and *Holoptychus*. Not one species is identical in these different formations; a result which agrees admirably with that already obtained in the other stages (*étages*) of the series of rocks of which the crust of the earth is composed.—*Literary Gazette*, No. 1329; *abd.*

FOSSIL MYLODON AND GLYPTODON

PROF. OWEN, in a lecture to the College of Surgeons, on April 27th, demonstrated the most striking characters of the new subgenus of megatherioid animals, the Mylodon;—pointing it out as an animal whose habit it must have been to feed on the leaves and the soft parts of trees, by raising itself on its great hinder extremities and pulling down the branches of trees with its strong fore arm and its tongue. The latter organ might be believed to be at least four times as large as that of the giraffe, judging by the size of the apertures for the lingual and hypoglossal nerves. There was also a peculiar character in the arrangement of the phalanges of the interior extremity; the internal being furnished with claws, while the two outer were of such a form as to render it certain that the animal must in progression have rested on their exterior surface; so as to combine in its one foot the ungulate and unguiculate characters upon which Linnæus has based his division of the two chief classes of Mammalia.

The Glyptodon had, in relation to the megatherium, the great interest of proving to what animal the large portions of osseous carapace, which had so often been found near the remains of the megatherium, belonged. They had been supposed, even by Cuvier, to belong to the megatherium itself; and he supposed it, in this respect, to resemble the armadillos. But portions of a foot and of a lower jaw, brought from South America by Mr. Darwin, had rendered it certain that some gigantic species of the armadillo tribe existed in the neighbourhood of the megatheria; and this had at length been proved by the discovery of the Glyptodon, of which the College had purchased the carapace. The bones of the greater part of the skeleton have been so injured in the exhumation that they could not be transferred to this country.—*Medical Gazette.*

FOSSIL XANTHIDIA.

ON Feb. 16, was read to the Microscopical Society, a paper by H. H. White, Esq., of Clapham, on Fossil Xanthidia. After stating that these infusoria, which are of a yellow colour, and found imbedded in the substance of chalk flints, formed a genus of the tenth family of the class *Polygastrica*, called *Bacillaria*, the author proceeded to describe twelve species, which were distinguished from each other principally by the number and form of their tentacula, which project from the external investment or lorica of the animal. Each species was separately described; and the author concluded with some observations on the mode in which they became silicified, and on the formation of flints generally.

FOSSIL ORGANIC REMAINS DISCOVERED IN 1812.

Mammalia.—In the month of December, some workmen in one of the quarries of Durdham Down, came upon a number of bones, embedded in the earth, in one of the fissures of the rock at about 30 feet below the surface. The excavation was continued to the depth of 10 feet, or 40 feet from the surface, during which were collected many bones and teeth, for the most part in perfect preservation, which, on being examined at the Philosophical Institution at Bristol, were found to be teeth of the bear, hyena, hippopotamus, rhinoceros, ox-deer, and elephant; and the head and horns of the ox, and portions of bone of these and other animals; but, as there appeared no immediate prospect of finding a cavern, the excavation was abandoned. The reader will remember the discovery of the remains of animals, (which now inhabit mostly only tropical climates,) in several parts of this county, as in Kirkdale, Banwell, Kent's Cave (near Torquay,) &c. The peculiarity of the present discovery is, that the remains have only as yet been found in a fissure, which, as far as can be ascertained, extends a considerable depth lower than yet examined. This is not the case in the other places above mentioned, where the bones are all found in caverns; a circumstance in some measure refuting the theory of certain geologists, viz., that these caverns were the resort of the hyena or tiger, where they dragged in and devoured their prey, and ultimately died.—*Abridged from the Bristol Journal.*

Mammoth.—In cutting for the railway at Marden, a splendid fossil elephant or Mammoth, (one tooth of which weighs above 20lb.) has been discovered 20 feet below the surface. The organic remains of this animal have never before been found so low in the series as the wealden formation, in which the cutting is supposed to be made—and appears to prove that Marden Hill is composed of a recent deposit above the weald clay.—*Maidstone Journal.*

Ichthyosaurus.—Mr. W. Brown, of Belfast, has discovered in the lower greensand at Woodburn, near Carrickfergus, a large dorsal vertebra, and some smaller ones from the extremities of an *Ichthyosaurus*, the length of the largest vertebra is an inch and a half, and the diameter of its end 4 inches. Mr. James Bryce, Jun., M.A., F.G.S., who has communicated this discovery to the *Philosophical Magazine*, No. 129, adds that so far as he is aware, this is the only instance yet recorded of the discovery of Ichthyosaurian remains in Ireland.

Foraminifera in the Green Sand of New Jersey, (America.)—Prof. J. W. Bailey has brought to light the interesting fact, that a large portion of the calcareous rock defined by Prof H. D. Rogers as the third formation of the upper secondary, is made up, at the localities where he examined it, of great quantities of microscopic shells belonging to the Foraminifera of D'Orbigny; which order includes those multilocular shells that compose a large part of the calcareous sands, &c of Grignon and other localities in the tertiary deposits of Europe. Since the minute multilocular shells above alluded to were discovered, Dr. Torrey and Prof. Bailey have together examined specimens of limestone from Claiborne, Alabama, and have found in them foraminifera of forms apparently identical with those occurring in New Jersey. None of this order, except the genus nummulite, have heretofore been noticed in our green-sand formation. In this connection, we may also announce the interesting discovery recently made by Prof. Wm. B. Rogers of a vast stratum of *fossil infusoria in the tertiary strata of Virginia* It occurs about twenty feet in thickness beneath Richmond, and is found to be filled with new and highly interesting forms of *marine* siliceous infusoria. It would be interesting to have the specimens of the green-sand formation of the far-west, collected by Mr. Nicollet, examined, to see if infusoria or foraminifera may not be found in them —*Silliman's Journal*, vol xii No. 1

Dinotherium.—Bones, pronounced to be those of the *Dinotherium*, have been found near Adelaide, South Australia, being the only instance of any remains yet discovered in that region, not belonging to the Marsupial Order. This fact is stated in a communication from Governor Grey to the Geological Society.

Ornithichnites, or *Ornithichnoides*, as they are variously termed, and presumed to be the markings of the feet of gigantic Birds, have been discovered in the new red-sandstone of Connecticut and New Jersey, United States, and some specimens were exhibited to the Geological Society, by Dr Mantell, on Jan, 4, 1843.

Insects.—Mr. Brodie has described to the British Association, a discovery lately made of the remains of Insects in the lower beds of the lias formation in Gloucestershire. Such fossils being comparatively of great variety, and, with one exception, not having been before discovered in the lias, he was unwilling to delay any notice of the occurrence of these organic remains in the lowest members of our oolitic series. His former discovery of insects in the Wealden led him to a closer investigation of the strata in the neighbourhood of Gloucester; and the result had proved highly satisfactory. He had already detected elytra of one or more genera of coleoptera; and one or two wings of some insects which resembled that of the libellula.

The above fossils are generally of small size. The largest elytrum is a little more than half an inch long, and the largest wing about an inch in length. Nor are they by any means abundant. The beds in which they occur consist of thin courses of blue, green, and white limestone, forming some of the lower beds of the lias formations so extensively developed in the neighbourhood of Cheltenham and Gloucester.—*Literary Gazette*, No. 1329.

Vegetable Remains.—Mr. J. Dawes has stated to the British Association, the fact that Vegetable Remains, probably marine, occur in strata in which they had not hitherto been noticed—between Birmingham and the collieries near Tipton, through Gravelly Hill, Perry, and Great Barr.—*Literary Gazette*, No. 1329.

Trees.—In White Moss, between Middleton and Failsworth, (states the *Manchester Guardian*,) a large number of Trees of enormous magnitude have been discovered at a depth of about six feet; some of the oaks have been nearly twelve feet in girth, and forty feet in length. Several trees of the oak, fir, and yew tribe have been found to be thoroughly sound, even to the outermost part. A large quantity of the timber has most unquestionably been on fire. Singular as it may appear, the trees found in this moss have invariably been met with lying in a direction either south east or due east.

Trees and Nuts.—In excavating a canal in the valley of the Rea at Saltby 1½ mile N. E. of Birmingham, a peaty deposit, containing trunks and branches of Trees and Hazel Nuts has been discovered under five feet of superficial detritus; and in the same bed were also found, Stags' horns, apparently of the existing species, *(Cervus elephas)* likewise the core of the horn of an Ox, one foot in circumference at the base, and one foot eight inches in length. This carbonaceous deposit reposes on the usual marine drift of the district, and is overlaid by a bed of variable thickness, of fine, white, or mottled clay, above which occurs the superficial detritus.

Lepidodendrons.—On the southern shore of the Tweed, between the Carr Rock and Spittal, there have been found embedded in sandstone, some fine specimens of *Lepidodendron Sternbergii*: some with a trunk 6 or 7 feet in circumference; the rounded branches being distinctly seen with all the peculiar outward markings clearly and regularly impressed upon them.

"THE MISSOURI LEVIATHAN."

(*See Vignette, in Title page.*)

Such is the popular name of a gigantic skeleton exhibited for several months during the past year, at the Egyptian Hall, Piccadilly. The bones are stated by their discoverer, M. Albert Koch, to have been found in the year 1838, near the shores of the river *La Pomme de Terre*, a tributary of the Osage river, in Benton County, in the State of Missouri, lat. 40°, and long. 18°.

Professor Owen has reported to the Geological Society, the results of his examination of this Skeleton, commencing with the important question—What is the species of animal to which it is to be referred? It is, he says, a mammiferous animal, and the bones of the anterior extremities prove it to be a member of the great primary group of *Ungulata*, while the enormous tusks of the upper jaw show that it belonged to the group of *Pachydermata*; and the molar teeth that it was identical with the Tetracaulodon, or *Mastodon giganteum*. With respect to the position of the tusks, Professor Owen explained, that in consequence of the mode of insertion in the sockets, the tusks of the Mastodon, like those of the elephant, can be turned in any direction, when the natural attachments are destroyed by decomposition; and that, consequently, superincumbent pressure may have bent the tusks in "the Missouri Leviathan" into their present horizontal position. The author next considered the relation which the Tetracaulodon and the Mastodon bear to each other, and whether they ought to be regarded as distinct genera. He first alluded to the researches of those anatomists who had preceded him in the inquiry. Dr. Godman, of Philadelphia, founded the former genus upon a fossil lower jaw, which contained molar teeth agreeing with those of the Mastodon, but which possessed two tusks, projecting from the symphysical extremity. Mr W Cooper, of New York, suggested that the Tetracaulodon was the young of the *Mastodon giganteum*, and that the tusks were merely milk teeth, which were lost as the animal became adult. This latter opinion, advocated by some zoologists, but not illustrated by analogies, was opposed by Dr Hayes, who adduced in an elaborate memoir what he considered sufficient evidence to prove that Dr. Godman had not committed the error of describing as a new animal the young of a known species, and he adds, with reference to the suggestion of Mr T R Peale, that the tusks in the lower jaw might be only a sexual distinction, and that the then existing state of knowledge was not sufficient either to confirm or refute the suggestion. An attentive examination of several lower jaws in Mr Koch's collection, at the Egyptian Hall, containing molar teeth of the *Mastodon giganteum*, has enabled Professor Owen to establish the important fact, that an animal of the same size and molar dentition as the Mastodon, was characterized in the adult state, by a single tusk or incisor projecting from the symphysial extremity of the right ramus of the lower jaw, and that the assumed peculiarity of the Tetracaulodon, namely, the two inferior tusks, one in each ramus, is manifested only by immature animals There are also in the collection several lower jaws, without any trace of tusks, and agreeing, therefore, with the old character of the genus Mastodon. In all these specimens, the molar teeth present the forms and proportions which distinguish the *Mastodon giganteum*. Professor Owen then detailed the series of comparisons by which he had arrived at the conclusion, that the Tetracaulodon of Dr Godman is the immature state of both sexes of the *Mastodon giganteum*, and that it loses those distinctions in the mature state of both sexes, by the loss of one tusk in the male, and by the loss of both in the female.

Tetracaulodons appear, from Mr. Koch's collection, to be as numerous as Mastodons, yet as little do we perceive or hear of two forms of humeri, ulnæ, radii, femora, or tibiæ, as of lower jaws; while the femora of the *Elephas primigenius* associated with them, are at once recognizable by modifications, which might be expected to accompany true generic differences in the rest of the organization. With the exception, therefore, of a few bones of the Mammoth, Professor Owen refers all the other remains of Proboscidian Pachyderms in Mr. Koch's important collection to the *Mastodon giganteum* of Cuvier. They illustrate, he says, the true and very remarkable characters of that extinct animal in a more complete manner than has ever before been done, and clear up the doubts which the inspection of solitary specimens had occasioned. The height of the skeleton taken at the withers or dorsal spines, provided the collocation of bones be correctly observed, Professor Owen estimates at ten feet; and the length from the intermaxillary bones to the end of the sacrum at sixteen feet, or four feet more than that of the large Asiatic elephant in the Hunterian Museum. Such are the leading results arrived at by Professor Owen, proving, in the main, the Tetracaulodon and the Mastodon to be one animal. Further details of this interesting and important inquiry will be found reported in the *Athenæum*, No. 718.

THE ARTESIAN WELL OF GRENELLE

THE operation of tubing the Well at Grenelle has been completed in the most satisfactory manner. To understand the importance of this work, it may be stated that in February, 1841, after eight years' persevering labour, the spring at Grenelle began to pour forth a volume of water of not less than 2600 litres a minute. But, although the source was as pure as that of the Seine, it had as dark a colour as the water in the gutters of the streets. A pipe of joints, 1800 feet in length, copper turned, made as a telescope, was placed in the excavation; but not being strong enough to resist the force of the ascending waters, it was soon flattened and destroyed. A new tube, of wrought-iron, was then made, each joint of which was thick enough to resist a pressure equal to 70 atmospheres. On September 20, after only four days' labour, the tube was properly fixed, and the water began to flow abundantly, clear as rock crystal, and of a milk-warm heat. On the site of the old workshop, from the middle of which the current flowed, has been erected a scaffolding of strong pine boards, 100 feet high, which will direct and form a channel for the waters rising to this height. Paris will henceforth possess an inexhaustible supply of excellent water, running from such an elevation as to be easily distributed to the loftiest situations in the city.—*Times, September* 27. (See the *Frontispiece* to the present volume.)

ARTESIAN WELL IN PICCADILLY

THE sinking of the Artesian Well in Piccadilly has been attended with perfect success. After boring to a depth of 240 feet, water was arrived at, which immediately rose to within 80 feet from the surface. Over the well has been erected an iron pump of gothic design; and the expense of the entire work is stated at 600*l*.—*Civil Engineer and Architect's Journal*.

Astronomical and Meteorological Phenomena.

ENCKE'S COMET.

On March 14, was made to the Academy of Sciences, at Paris, a communication by M. Arago, relative to Encke's Comet, which had, he said, been seen, and carefully noted, at the observatory of Paris, by two astronomers, MM. Laugier and Mauvais. The observations were made on the 12th instant. The position was carefully compared with that laid down beforehand by Prof. Airy and the German astronomers, and the difference was found not to exceed twenty seconds. The learned Professor added, that the Academy had just received a communication from an astronomer of Marseilles, M. Valz, announcing also some satisfactory observations respecting this comet. One of the principal objects at the Observatory was, said M. Arago, to ascertain the diameter of the comet, an extremely difficult operation, on account of the vast extent of this pale and vaporous body, but one of great interest. M. Valz, having stated that the comet, which returns at short intervals, diminishes in diameter at each return, (this opinion being a modern version of the hypothesis of Herschel, who stated that comets at each transit lose to a great extent their volatile nature, and become more and more solid,) M. Laugier, in his observation on the 12th inst., concluded that the angular diameter of the comet was one of three minutes, which would give an enormous size to it, considering its immense distance from the earth.—*Athenæum*, No. 753.

NEW COMETS.

On Oct. 28, M. Laugier, Astronomer at the Paris Observatory, discovered at seven in the evening, in the constellation of the Dragon, a telescopic Comet, extremely faint, and without any appearance of tail. At ten minutes after ten at night, Paris mean time, its right ascension was 16 hours 41 minutes, and its northern declination 68 degrees and 44 minutes. The right ascension, in 6 hours, increased by 3 minutes and 34 seconds, and the declination diminished 20 minutes in the same interval of time.

On the official communication of this discovery, to the Academy of Sciences, it was mentioned by M. Arago, as a remarkable proof of the continual watchfulness of the gentlemen at the Observatory, that, a quarter of an hour after the discovery of M. Laugier, and on his being relieved by his colleague M. Mauvais, the latter, who was ignorant of the observation made by M. Laugier, also discovered the comet. M. Arago, in allusion to the opinion which has been frequently expressed that comets are so numerous in the heavens, that many must pass even within our own planetary system without being discovered, particularly noticed the fact of the simultaneous discovery of M. Laugier and M. Mauvais as being indicative of a great degree of perfection in the observation of astronomers.

On Nov. 7, it was announced to the Academy, that M. Laugier had been able to take observations on the 2nd, 4th, and 5th inst., and to form his calculation of the parabolic elements of the Comet. The work of Ringre mentions a comet which was seen in China in 1301, the elements of which, calculated according to the observations of the Chinese, accord in a remarkable manner with the results of the new calculation. It is, therefore, possible that M. Laugier has had the good fortune to record the second passage of a comet whose period of travelling occupies more than 500 years.—*Athenæum*, No. 1,020.

TOTAL ECLIPSE OF THE SUN.

On August 22, M. Arago communicated to the Academy of Sciences, at Paris, the following Report on the Eclipse of July 8th, as observed by him and other astronomers at Perpignan.

We can only select from the most striking observations, the following on the question as to a lunar atmosphere:—

During an eclipse, the moon is designed in black, upon the sun, in its true form. The region of the sun which remains visible is, therefore, limited by two portions of circumference. In the points at which they meet, these two arcs, one dark, the other luminous, form two curvilinear lines which are called *horns*, and which are sometimes very thin and sharp. The luminous rays of the sun, which define clearly even the summit of the horns and surrounding parts, cross the surface of the moon to arrive at the earth. If the moon had a sensible atmosphere, these rays would deviate, the circular form of the sun would be affected, and the horns would show inflections and irregularities. Nothing of this kind was seen at Perpignan. It was only at rare intervals that the horns appeared mutilated, and they were never so completely. The observations on the bright spots of the sun led the astronomers of Perpignan to the same conclusion as to the non-existence of a lunar atmosphere. When the edge of the moon, during the eclipse, passed a solar spot nearest the black disc of the sun, it had the same luminous intensity as the remainder. This equality of light, (says M. Arago,) would not have existed if a vapour of any kind, even of no greater extent than the distance of the Luxembourg from the Observatory, had surrounded the moon as an atmosphere.

The number of stars seen at Perpignan, during the height of the eclipse, was only ten, from which we may infer that the darkness was at no time great. By the accounts of other astronomers, who watched the eclipse, a greater number of stars was visible than that seen by M. Arago and his colleagues. This was particularly the case at Montpellier, and also at Milan, although without the central range of the eclipse.

The thermometrical observations of M. Arago are less extensive than many persons could have wished. He states, that the two minutes and a quarter of the total occultation of the sun sufficed to cool the atmosphere to such an extent as to cause an abundant dew to fall upon the trees and plants, which were dripping with wet when the sun again made its appearance; but he has omitted to state, with precision, the degree to which the mercury fell in the thermometer. M. Lentheric, professor of mathematics at Montpellier, explicitly states that at the commencement of the eclipse there the thermometer stood at 18° Centigrade (about 75° Fahrenheit). At the moment of its greatest obscurity, it marked only 15½°; but at the end of the eclipse the mercury rose to 20. M. Lentheric relates a curious fact as to the termination of the phenomenon. The dazzling effect of the sudden return of the light, he says, was such, that he could not, at the moment, distinguish the hands of his chronometer, and therefore was unable to determine the moment of the event with the precision desired.

An interesting experiment was made by the Faculty of Sciences of Montpellier, to ascertain the luminous intensity at the different periods of the eclipse. The means employed was the Daguerréotype. All the proofs gave a sufficiently defined image of the phenomenon to enable the members of the faculty to determine, by actual admeasurement, the relative apparent diameters of the sun and moon. At Toulouse, M. Flangerques not only noted down a fall in the temperature of 4° Centigrade during the eclipse, but also saw the mercury fall in the barometer. The mercury fell to thirty one hundredths of millimetres below the height at which it would have stood if the difference of temperature had been the cause of the variation. This depression is indeed, of itself unimportant, but it, nevertheless, shows a deviation from the normal action of the barometer, for it is known that this instrument usually goes on rising from the getting up of the sun until nine in the morning, when it attains its maximum.

M. Arago states, that during the latter period of the eclipse, he saw, on the edge of the black disc of the moon, a sort of protuberance of fire two minutes in height and presenting an appearance like that of the glaciers of the Alps illuminated by the setting sun. At Narbonne, the appearance was that of a distant light house. Some members of the Academy have already thrown out the idea that this protuberance is a mountain of the sun rendered visible in the atmosphere of that body. The theory of Herschel is that the sun which is the source of light and heat to us and which has been regarded as an incandescent body, is in reality dark and inhabitable. M. Arago whilst he affirms that the protuberance which he observed is not of the moon—no such discovery having ever been made even with the most powerful telescopes—does not admit that it is a mountain of the sun, not that there is anything repugnant to the laws of science in supposing the existence of a mountain of the sun, 17 000 leagues in height—or, according to M. Littrow's calculation of the extent of the protuberance, 30 000—for objects are only large or small comparatively, and Herschel has shown that the sun by its prodigious mass might have mountains even 120 000 leagues in height, but M. Arago's doubts are founded upon the diversity of opinions as to the character of this protuberance. This mountain, if it were one, would have presented a fixed projection, and the same angle to each of the observers, which was not the case. M. Arago, therefore, is disposed to regard the phenomenon as one of diffraction. It is proposed, however to determine this point by experiments with artificial means on the summit of some high mountain.

Another curious circumstance mentioned by M. Arago is the following:— At about the middle of the eclipse M. Arago was able to perceive the whole disc of the moon. What was the light which enabled him to do this? It could not be the ash coloured light, (*la lumière cendrée*) left by the eclipse, for that is exceedingly feeble. There is in this fact a mystery which is perhaps impenetrable in the present state of astronomical science.

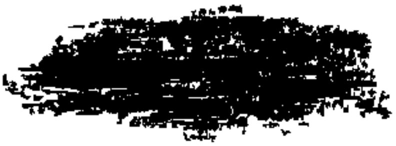
The effect of the eclipse upon the population of Perpignan, who were watching it, is described by M. Arago as singular and even affecting. The gravest persons were unable to restrain expressions of joy when the sun re appeared, and, whilst the eclipse lasted, anxiety was depicted on every countenance. The effect upon animals was remarkable. One of the friends of M. Arago had placed five healthy linnets in a cage. During the sudden darkness of the eclipse, three of the five died. The oxen formed into a circle, with their horns thrust forward, as if preparing for the attack of an enemy. At Montpellier, bats and owls left their retreats and sheep laid down as for the night, and the horses in the fields were in a state of terror. In addition to these facts, it was stated to M. Arago, in the Academy, on the authority of M. Fraisse, a distinguished naturalist, that a swarm of ants in full march stopped short at the moment of occultation.—*Galignani's Messenger*, *Athenæum*, No. 775, *somewhat abridged*.

In the last named journal also, is an extract from a private letter from Mr. Francis Baily, Vice President of the Astronomical Society, giving an account of this superb phenomenon, as witnessed by himself at Pavia, over which the line of central darkness exactly passed. At the moment when the total obscuration commenced, a brilliant crown of glory encircled the moon, like the "Aureola," which Catholic painters append to their saints. Suddenly, from the border of the black and labouring moon, thus singularly enshrined, burst forth, at three distinct points, within the aureola, purple or lilac flames visible to every eye. At this moment, from the whole assembled population of the town, a simultaneous and deafening shout broke forth. A similar manifestation of popular feeling is recorded at Milan, occasioned by the self-same astonishing spectacle, accompanied in the latter instance with a general "*Huzzah! vivent les astronomes!*" The eclipse was also viewed from the Superga, near Turin, by our Astronomer Royal, Mr Airy, apparently under less favourable circumstances. We have yet heard of no astronomer witnessing from a great elevation in the Alps the shadow striding from peak to peak, or blotting in succession the fair fields of North Italy. Such an exhibition must have been, perhaps, the sublimest which the eye of man can ever witness as a mere physical phenomenon.

ECLIPSES IN 1843

This year there will be three Eclipses—viz., two of the Sun and one of the Moon, of which only the latter will be visible in England. The first of these phenomena will be an annular eclipse of the sun on Tuesday, the 27th of June, commencing at 20 minutes past 7 in the evening, and being visible chiefly in the Great Pacific Ocean and in South America. The second is a partial eclipse of the moon, in the night of Wednesday, the 6th of December, which will be visible in these parts, commencing at 18 minutes past 11, and when two digits of the lower disc of the moon will be eclipsed. The third and last is a total eclipse of the sun, early in the morning of Thursday, the 21st of December, and invisible here, but visible in the Chinese empire, Hindostan, the Islands of Ceylon, Sumatra, Borneo, &c.—*Times*.

SINGULAR APPEARANCE ABOUT THE MOON



Dr. Armstrong, of South Lambeth, states, that on the 25th of February, P.M., the moon being full, and at an altitude of ten degrees, a brightly-illumined belt extended over her disc, in a direction perpendicular to the horizon. Its width, which exactly equalled the moon's apparent diameter, was uniform, and well defined from end to end, each being limited by a small cirro-stratus cloud. The higher portion of it measured in length three and a half such diameters, and the lower two. He was not fortunate enough to observe the manner of its formation; but it was too interesting a sight not to watch it intently till its disappearance. At eight o'clock, it began to shorten at its upper extremity. Its edge underwent no diminution in distinctness; but had an inclination of 45 degrees to the moon's horizontal diameter; and which it preserved without any perceptible variation, till the whole vanished. What struck Dr. Armstrong as very remarkable, was the perfect rectilinear uniformity of the belt itself, as well as the manner of its decrease; the inclination of its upper edge towards the horizon not varying in the smallest degree, but preserving its parallelism rigorously during its downward progress to the base. When very near it, however, the remnant, instead of shortening, dissolved. The time of its disappearing occupied about 40 seconds.—*Communicated by Dr. Armstrong.*

THE MOON AND JUPITER.

On the evening of September 20, the Moon was observed very near Jupiter, the conjunction in right ascension being between two and three o'clock in the afternoon. Between the parallels of 14 degrees north, and 54 degrees south latitude, the moon passed over the planet, producing an occultation. This planet had been occulted by the moon every time she had passed him during the year, excepting in the months of January and February.—*Standard Newspaper, Sept.* 23.

LUNAR RAINBOW.

On the stormy evening of Oct. 18th, this rare and interesting phenomenon was witnessed by some persons in passing over the Glass mountain, near Aberystwith. The arch appeared of equal dimensions, at least as to span with the solar bow, and also presented a similar variety of colours, only less vivid. From the peculiar position of the beholders, its circular figure was apparent; as more than a semicircle was actually visible, while the remainder might easily be traced by the mind's eye, through the bowels of the mountain. The illusion continued more than ten minutes, the full moon all the time shining with unveiled splendour in the clear east.—*Welchman.*

ASTRONOMICAL PUZZLE.

Mr. Glaisher, of the Cambridge Observatory, reports the following remarkable appearance on October 4: "At midnight, the sky had become perfectly clear, and the air frosty. At 21 m. after 12, I was much startled at what appeared a vivid flash of lightning, but, on turning to discover its direction, I saw a bright streak of light in Orion, about 20 degrees in length at the moment of discovery: its centre was as bright as Jupiter, and the light plainly emanated from it in quick flickering waves on each side simultaneously; and at each wave, the length and brightness decreased. This part of the phenomenon lasted ten seconds; I therefore had time to recover my surprise, and perceive the working of it. When the waving ceased, there appeared to be a bright star in the place where I had seen the centre light of the streak, but whilst considering what star it might be, that I might note with accuracy the place of the phenomenon, I perceived that it gradually faded, and in about two minutes it entirely disappeared, having, unlike the generality of meteors, maintained the same position all this time. The line of direction of the streak made, with Orion's belt to the south-east, an angle of about 40 degrees, the centre light being three degrees north of the upper part of the belt, and in the same straight line with the three stars in it."—*Norwich Mercury.*

TERRIFIC STORM IN MADEIRA.

THIS island was visited by a tremendous storm, on the 15th of October, which continued till the night of the 20th. No such convulsion has happened in the island since the tremendous visitation of October, 1803, ever since known there by the emphatic name of "*The* Flood,"—when the houses of the town were carried out to sea, and 400 of the inhabitants drowned. The fury of the elements on the present occasion is said to have even exceeded that memorable tempest, though it is believed that the loss of life is far less.

WATERSPOUT.

ON Oct. 25, a Waterspout was seen in the neighbourhood of Ayr, in the afternoon. The snow, which had fallen copiously early in the day, had nearly ceased, but the mass of dark cloud was still sweeping along in a N. W. direction. It seemed to extend but a short distance seaward, but was very dense at its western limit, where it appeared very much agitated by eddies. The commotion of the elements became more distinct in consequence of the snow ceasing. A part of the snow-cloud approached the surface of the water, which then assumed a boiling aspect—appeared as if emitting steam—and rose vertically in various places. In one instance, the phenomenon referred to was distinctly formed. It appeared to rise from the surface of the water in the shape of a cone, communicating at its apex with an apparently aqueous column, ascending, perhaps, 100 feet. It expanded towards the top, so as to resemble an inverted cone placed upon an upright one. The shaft sometimes curved with the current, and then in a serpentine form. The appearance was visible about a minute. The direction of the wind immediately beyond could not be distinctly ascertained.—*Ayr Advertiser.*

CYCLE OF EIGHTEEN YEARS' SEASONS.

MR. LUKE HOWARD has read to the British Association, a paper "On the Cycle of Eighteen Years in the seasons of Britain." Mr. Howard has found that the seasons come round in a cycle of eighteen years, and that of these, in the first nine, beginning with 1824, warmth predominates; and in the last nine, ending with 1842, cold predominates. Out of the nine cold years we have just emerged. He has constructed a thermometrical curve for the nine warm, and another for the nine cold, years; and he exhibited these in juxtaposition, and with a curve of the sun's declination. He has also projected similar curves for the rain during the whole eighteen years, on the average of each month; and he has found the total amount of the rain in the nine warm years 238.68 inches, averaging 21½ inches per annum. In the nine cold years, it was 234.33 inches, averaging 26 inches per annum; so that there was, on the average, an excess of half an inch of rain per annum in the warm years. As to the distribution of rain in the warm years, as compared with the cold ones,—December, January, February, and March, were comparatively dry months; and then came a glut of rain in April—a distinguished characteristic of warm years; and dry winter months, with rain in April, he regarded as a most favourable season for agriculture. Then, May was fine, (as to rain,) in both cases; and the rain was nearly the same in both cases, in June and July, rather more abundant, however, in cold than in warm years. In cold years, August was dry; and in warm years, wet. September was wet in warm, and dry in cold years; in October the cold and warm years nearly agreed in quantity; November was rather wetter in cold than in warm years; and December was dry in warm years, and in cold years an exceedingly wet month.

METEOROLOGICAL OBSERVATIONS AT KEW.

The use of the Royal Observatory, at Kew, having been granted to the British Association, they have voted the sum of 50*l.* to Prof. Wheatstone to construct an apparatus which shall record the operations of all meteorological instruments whatever. Amongst the instruments forming this set of apparatus will be one for measuring the force and direction of the wind; this instrument may be sent up to different heights by captive balloons, secured at the required altitude; and thus, at a small expense, may be measured the variations of the wind at different heights above the surface, within 8,000 or 10,000 feet. Prof. Wheatstone also proposes to avail himself of the principle of his electro-magnetic telegraph, viz. the determination of the feeble electric current by the mere contact of the mercury in the tube with a fine platina wire, may be made a material recorder to register every half hour the varying indications of the barometer, the thermometer, and the synchrometer, (and probably the anemometer,) as accurately as the most careful observer would be able to do; and requiring only a few minutes' attention each day, to put it in order for 24 hours.

SOLAR SPOT.

About half way between the eastern edge of the Sun's disc and its centre, a very beautiful dark spot was visible in January, travelling towards the right, accompanied by the usual luminous border; and might be distinctly seen, (when the atmosphere proved favourable,) with telescopes of moderate power, having the sight protected with a piece of dark coloured glass.—*Blackburn Standard, Jan.* 15.

METEOROLOGICAL CIRCUMNAVIGATION.

ON August 1, Prof. Erman read to the Academy of Sciences at Paris, a Report on a Meteorological voyage of Circumnavigation. In the course of M. Erman's Expedition round the World, the vessel in which he sailed, passed four times from latitude 50° north to 58° south, and during this transition M. Erman made observations with the barometer six times a-day. He states from them, that, in general the pressure on the barometer goes on diminishing very slowly from the equator to the poles, and what proves that this depends on the general constitution of the atmosphere, is the fact that the diminution is constant and regular. Thus, in the waters of Cape Horn, as well as on the coast of Kamschatka, the mean height of the barometer is twelve millimetres lower than the mean height of the great equinoctial ocean. Hence, it follows, says M. Erman, that the pressure of the air is not the same on basins of the same level in vast seas. M. Erman concludes from the result of his observations, that a hope may now be reasonably entertained of becoming fully acquainted with the general law of the distribution of the air over the surface of the globe, so far as that law may appear to depend on pressure.—*Athenæum*, No. 772.

AUGUST ASTEROIDS.

M. ARAGO states that the period between the 10th and 12th of August still retains a marked superiority for this phenomenon, which is still so little understood. M. Littrow of Vienna counted on the night of the 10th of August, 129 of these meteors per hour. On the same night, M. Louard of Rennes, counted 11 per hour at Tours, and in the department of the Doubs, M. Laugier and M. Mauvais witnessed a shower of these meteors. At Paris and at Toulouse, the observation of M. Eugene Bouvard and M. Petit were attended with less marked results, but still they were sufficient to prove that the period of the year above named is that in which the phenomenon abounds. In a communication to the Academy M. Bordot, of Grand Lemps, in the Isère, states that he watched with great attention the passage of these meteors on the night of the 11th of August. In no instance, when they exploded, did he hear any noise, but the explosion was in several instances, followed by a long train of phosphoric light.—*Athenæum*, No. 777.

ATMOSPHERIC SPECTRE.

ONE of those interesting and, in England, rare phenomena, familiarly known as "Spectres of the Brocken," was in December, witnessed by a gentleman in the direction of Wardour, near Shaftesbury. The early part of the day was obscured by fog, till about 3 o'clock, P.M., when the sun bursting through the clouds, illumined the hill-tops, whilst the valleys remained in mist. At a point where the road begins to decline, the observer witnessed a spectre of gigantic proportions, which for a time continued a close imitator of his actions.

METEOROLOGICAL SUMMARY FOR 1842.

(Communicated by DR ARMSTRONG, *South Lambeth.)*

Months	Temperature					Atmospheric Variations			Hygrometer		Modifications of Cloud.						
	Fahrenh		Mean														
	Max	Min	Reaumur	Centigrade	De Lisle	Mean Pressure in inches	Prevailing current	Solar Variation	Rain in inches	Difference [illegible]	Cirrus	Cirro stratus	Cumulus	Cumulo stratus	Cirr cumulus	Nimbus	Stratus
Jan	48	25	2.00	2.75	146	30.02	NE NW W	7.24	0.96	−1.93		*			*		
Feb	50	27	2.75	3.75	144	30.025	SW E	11.31	1.095	+0.315		*			*		
March	60	30	6.00	7.75	139	30.150	SW NW	12.53	2.025	+0.940		*			*	*	
April	80	29	6.5	8.00	138	29.975	E NE	17.84	0.67	−1.140		*	*			*	
May	75	36	10.00	13.00	135	30.025	SW NW	18.22	2.215	+0.515	*	*	*	*	*	*	
June	98	45	17.00	22.00	117	30.175	E NE SW	22.42	3.905	+2.245	*	*			*	*	
July	82	46	14.00	18.00	123	30.32	SW NW NE	18.40	2.724	+1.024	*	*	*			*	
Aug	93	62	17.75	22.25	116	30.20	SW E NE	20.18	1.380	+0.380		*	*		*		
Sept	84	45	14.00	18.00	123	30.125	SW SE NE	14.038	3.124	−0.141	*	*					
Oct	65	25	5.75	7.25	140	30.075	NW SW	14.29	1.39	−3.930		*					
Nov	57	30	5.00	6.00	141	29.825	NW E SW	8.83	4.631	+2.456		*				*	
Dec	60	29	5.5	7.00	139	30.30	SW	6.78	0.72	−1.415		*					

Number of Days for the greater part rainy 19
" " fair 346

Number of Days fair throughout, but more or less cloudy 139
" cloudless, or nearly so, throughout 81

Bright lunar halo, Feb 16, extraordinary appearance in the atmosphere, in the lineal direction of the moon, Feb 25, delineated and described in the *London Saturday Journal*. Faint lunar arch through Cassiopeia and the back of Cepheus, March 10. Snow on the ground from Jan 10 to 15 inclusive. Highest tides on Jan 11, 29, 30, 31, Feb 14, 26, 27, 28, March 12, 13, 14, 15, 26, 27, 28, 29, 30, April 24, 25, Aug 10, Sept 6, 7, 18, Oct 4, 5, 6, 7, 8, Nov 20, Dec 1, 4, 21, 26. Violent thunderstorm, with hail and rain, April 24, by which the cross of Brixton church was displaced, and a house near to it set on fire. Thunder and lightning, May 9, June 14, 19, July 20, 28, on which latter day, the most terrific and disastrous thunderstorm took place, accompanied by torrents of rain, that has occurred for many years. It began at a quarter past midnight, and continued, with scarcely any interval, till six o'clock in the morning. Thunder also, Aug 10, 11, 25, 29. Much thunder and lightning, Sept 8. High winds, March 2, 31, June 25, 26, July 5, Sept 29. Violent hurricane for half an hour, Nov 11. Dec 24, the blackbird and mavis's notes were distinctly heard at daybreak, and, during the period between 3 and 4 of that day, the gnats were performing their evolutions with all the elasticity which could have been inspired by the warmth of a May evening. The clouds of most frequent occurrence are marked by asterisks, of less frequent, by colons.

Obituary

OF PERSONS EMINENT IN SCIENCE OR ART. 1842.

Aylmer Bourke Lambert, F.R.S., many years Vice-President of the Linnæan Society, who has munificently bequeathed the whole of his valuable library and collection to the British Museum.

Geo. Antonio Antolini, architect and engineer.

Sir Charles Bell, author of the *Bridgewater Treatise* "On the Hand."

The **Earl of Leicester**, (better known as Mr. Coke of Norfolk,) the author of many tracts on agricultural subjects.

Dr. Patrick Kelly, author of the *Universal Cambist*, and many useful elementary works on Astronomy.

Peter Ewart, the chief Engineer in Her Majesty's Dockyard, Woolwich.

J. Foulston, architect of several important buildings in the West of England.

Charles Heathcote Tatham, architect.

Robert Mudie, a voluminous writer on popular science.

James Ivory, K.H., F.R.S., and Member of the Institute of France, a highly distinguished Correspondent of the *Philosophical Magazine*.

Admiral Dumont d'Urville, the celebrated circumnavigator.

Dr. Vogel, the naturalist attached to the Niger Expedition.

Chevalier von Wiebeking, author of several important works on Architecture and Engineering.

Sir Robert Ker Porter, historical painter and traveller.

Henry Hennell, F.R.S., an eminent chemist.

John Sidney Hawkins, F.S.A., author of a work "On the Origin of Gothic Architecture."

George Barret, painter in Water Colours.

Baron Larrey, Member of the Academy of Sciences, at Paris.

Dusommerard, the well-known Collector of Middle-Age Art.

Julius Eugen Ruhl, German sculptor.

— **Egerton**, the well known landscape painter of Mexican scenery.

John Goldicutt, F.R.S., architect.

John Harper, architect.

Sir William Ouseley, traveller and geographer.

Francis Wilkin, historical and portrait painter.

Lieut. Wellsted, I.N., traveller in Arabia and the Red Sea.

Count Alexandre de Laborde, traveller.

Clement Boulanger, painter, attached to the French Scientific Commission on the Meander.

— **Jovet**, of Autun, painter and antiquary.

The Rev. E. T. Daniell, traveller in Lycia.

John Varley, the well known Water-Colour painter.

Lady Callcott, an accomplished artist and botanist.

Samuel Seaward, F.R.S., the eminent practical engineer.

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